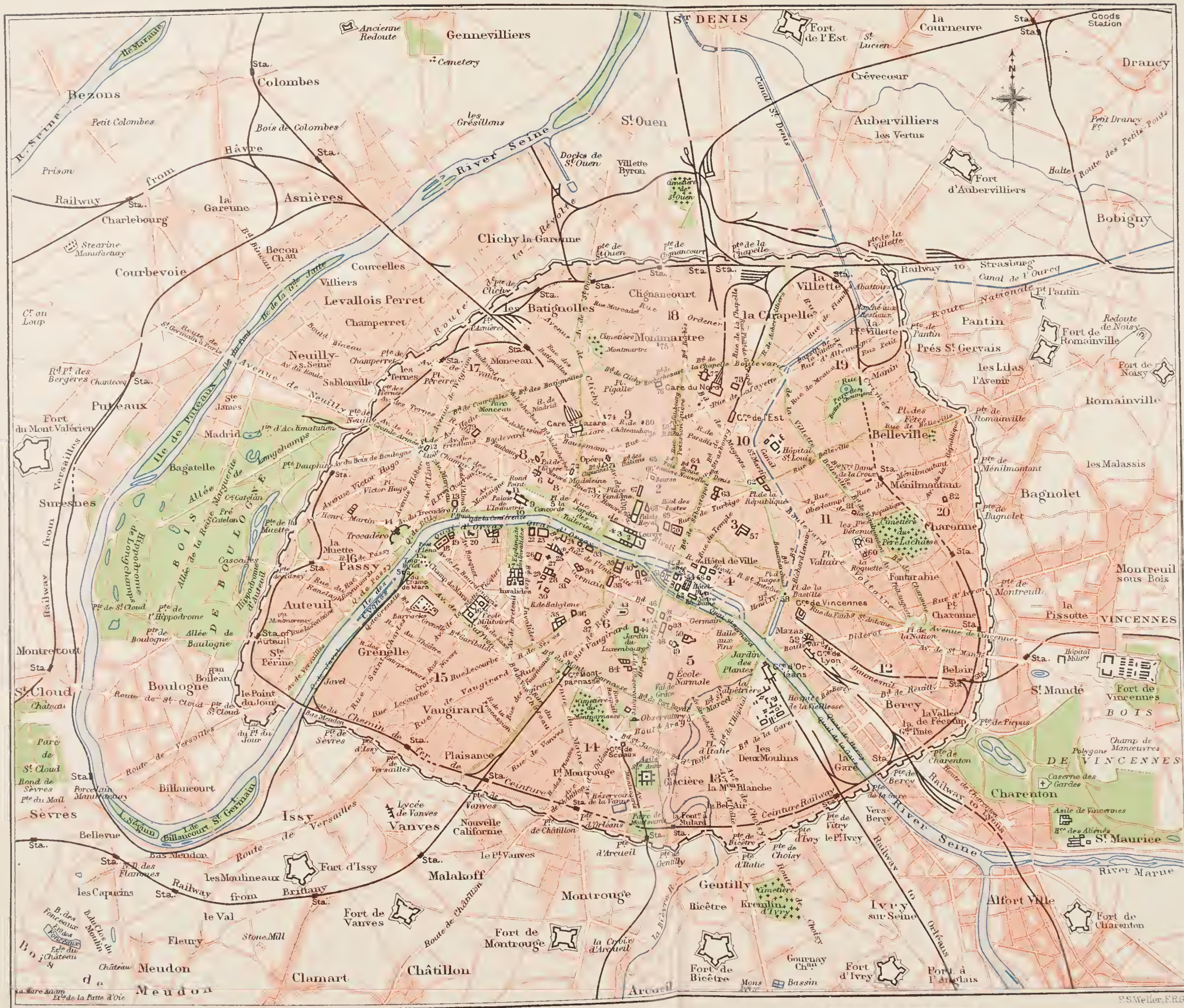


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Friction, in *Dynamics*, is a resistance offered to the relative motion of one body over the surface of another, due to roughness of the parts in contact. It is very difficult to rub two files together, the teeth of one file fitting more or less into the hollows of the other, and the obvious reactions of the teeth preventing relative motion. In that case motion either takes place by reason of the up-and-down slide of one set of teeth over the other, or by breakage of the teeth and a consequent complete change of the surfaces in contact. Such is the nature of friction; and its effects are not to be confounded with those of electrical actions that may take place when two substances are closely opposed, and that may help to resist lateral motion. It follows from the above that (i) friction always opposes the lateral motion; (ii) that it increases if the pressure between the two surfaces be increased; (iii) that the force required to start the motion after the surfaces have settled into intimate contact is greater than that required to keep up the motion; (iv) that there is a waste of energy in producing the motion, which will probably exhibit itself as heat; (v) that the friction may be diminished if by means of oil or some solid unguent the two rubbing surfaces may be separated a little and made to roll past each other on a thin film of the given lubricator. It is usual to distinguish between two kinds of solid friction—(a) *sliding* or *kinetic* friction, where sufficient force is applied to overcome the resistance offered to the motion. In this case the whole force of friction is experienced. It is found to be proportional to the total pressure, and to be practically independent of the extent of the surfaces in contact. Thus a load of one ton, distributed over a few square inches, introduces the same total friction as when it is distributed over a square foot, providing that the nature of the substances in contact is the same in both cases. Sliding friction is further found to be independent of the speed of motion. The force of friction per unit load is called the *coefficient of friction*, and is denoted by the letter μ . If W is the total load, the whole force of friction is μW . The coefficient is, therefore, the ratio of the force of friction to the total load. For steel on ice it has the value .014; for deal on deal, .35; steel on steel, .146; granite on granite, .30; and woollen cloth on cloth, .43. These results are due to George Rennie. (b) *Static* friction, where the external forces which act are

insufficient to overcome the whole available force of friction, and only balance part thereof. There is thus no production of motion against resistance and no evolution of heat. A cylinder would slide down a frictionless inclined plane without rolling; but with a sufficient intensity of friction each particle of the cylinder in contact with the plane would there be rendered motionless, and the upper parts would move downwards. This would cause rolling, and the energy spent in producing the rotation about the axis of the cylinder diminishes the amount left to increase the kinetic energy of the cylinder as a whole, which, therefore, rolls more slowly down the rough plane than it would slide down the smooth plane. Though rotatory motion is here actually caused by friction, it will be seen that it is yet a case of static friction; the total friction between cylinder and plane is not all employed in bringing the various particles successively to rest. Whether the friction be great or small, if it is sufficient to prevent any sliding, the cylinder will roll down with the same speed. This action of static friction in preventing sliding is of much utility; ordinary walking would be impossible without it, and there are many cases where it is put to some practical use. Thus, the action of friction-brakes depends partly on static friction, partly on kinetic. Power is transmitted from one pulley to another by belting that connects them; the power could not be transmitted unless there were static friction between pulley and belt. [LUBRICATION.] The friction of liquids is very slightly understood; the previous illustration of solid friction by means of two files cannot be of much help in understanding fluid friction, on account of the complex action of viscosity (q.v.) in setting the fluid in motion. It differs in two important respects from solid friction; its magnitude is independent of pressure, instead of increasing proportionately to the latter; and also its magnitude, instead of remaining constant when the speed varies, increases more than proportionately. For slow speeds, such as that of a slow river, fluid friction is proportional to the speed. For higher speeds, such as are attained by fast vessels in water, it varies as the square of the speed; and for such rates as are attained by projectiles in air, it varies as the cube of the speed. These laws must only be regarded as approximate.

Friday, the name of the sixth day of the week, is derived from the Anglo-Saxon *Frigga-daeg*—that is, the day sacred to Frigga, wife of Odin. The German is *Freitag*, and the Swedish *Fredag*. As the day on which Christ was crucified, it is observed by Romanists and strict Anglicans as a fast-day. This day is still looked upon by sailors of all nations as an unlucky one on which to commence a voyage.

Friedland, the name of several towns in Germany, the most famous being in East Prussia, 27 miles S.E. of Königsberg, on the left bank of the Alle. Here in June 14, 1807, Napoleon I. defeated the Russians and Prussians, and forced them to conclude the Peace of Tilsit.

Friedland, VALENTIN, also surnamed TROT-ZENDORFF, from his birthplace in Upper Lusatia, attained high repute as a teacher. In 1518, at the age of 28, he visited Wittenberg, where he came under the influence of Luther and Melancthon, with whom he contracted a warm friendship. A few years later he was appointed rector of the Gymnasium at Goldberg in Silesia, and achieved great success. He died in 1556.

Friendly or Tonga Islands, amounting to 180 in number, of which about 30 are inhabited, are situated in the South Pacific (lat. 18° to 24° S., long. 173° to 176° W.). They were discovered by Tasman in 1643, visited by various explorers in the next century and a half, but named collectively by Cook. The natives are the most advanced of the Polynesian race. Formerly a dual sovereignty like that of Japan existed, but King George Tubou I. is now the sole monarch, and has established a constitutional government, the interests of British subjects being watched by the High Commissioner for the Western Pacific. Physically, the group consists of submerged volcanic rocks, topped by coral formations of limestone, and covered with a deep rich mould that is highly productive. Peaks rise here and there to a height of 4,000 or 5,000 feet, and there are three active volcanoes, but the surface is generally level. Water is scarce and bad, and streams are rare. The vegetation is luxuriant, cocoa-nuts, sugar, cotton, coffee, copra, fruits, and vegetables being grown for exportation, and some varieties of timber, such as iron-wood, possess marketable value. Sheep and cattle do not thrive. Fishing supports a large number of the population. Tongatabu, the largest of the group, has an area of 128 square miles, and contains the capital, Nukualofa; Vavau, Eoa, Nomuka, Lefuka, Tofua, Late, and Kao come next in size. The climate, though enervating and damp, with considerable changes of temperature, is fairly wholesome; but leprosy, elephantiasis, and scrofula play havoc with the natives, and many lives are occasionally lost through earthquakes and hurricanes.

Friendly Societies, a form of mutual provident association which grew up in the latter part of the 17th century. They were recognised by the legislature in 1793, and by the Act of 1829 central was substituted for local registration—separate registrars being appointed for England, Scotland, and

Ireland. During the present reign they have been organised on a sound financial basis, and the "Ratcliffe Tables," the final outcome of much study, were accepted by the Royal Commission of 1871-74. By the legislation of 1875-76 one chief registrar was appointed, and it was enacted that audits should be held annually and a valuation of assets and liabilities at intervals of five years. Affiliation became legal in 1850, and since 1874 no obstacle has been placed in the way of the registration of branches. The *affiliated societies*, of which the Oddfellows and the Foresters are the most important, now include many members in the Colonies as well as Great Britain. Each *lodge, court, senate, or tent* has its own sick-fund, and enjoys almost unlimited freedom in the management of its own affairs. They are, however, grouped together in *districts* under the general control of a *central body* composed of elected delegates. The *collecting societies*, so called because they collect subscriptions by calling every week or fortnight at each house, occupy the first place numerically, containing over three million members, chiefly belonging to the poorest class. Their benefits are confined to insurance at death, and expenses of management absorb a large part of the funds. There are several other kinds of friendly societies, including the old *local societies*, which are gradually diminishing in number with the advance of those of a superior type. To this class belong the clubs which periodically divide their funds among the members.

Friends, SOCIETY OF, a Christian sect popularly known as QUAKERS. The latter name arose from the circumstance of their founder, George Fox (q.v.), having bidden a Derby magistrate to tremble at the Word of God. At first applied in derision, the word gradually came to be used by the Quakers themselves. Their proper designation originated in the practice of addressing each other as "friend" rather than by name. They hold as a body the leading doctrines of orthodox Christianity, but differ from the Church and the sects on important secondary points, and especially in the matter of practice. Their central doctrine is that of the inner light, which they derive from St. John's Gospel: "the light that lighteth every man that cometh into the world." This leads them to reject training in theology or secular learning as a preparation for the ministry, as well as the outward observance of sacraments and holy days, and set forms of prayer. At their meetings any member, man or woman, is listened to when he or she is moved to speak by the Holy Spirit. Their differences with other Christians on the subject of oaths and the payment of tithes led to much persecution in their earlier days, though they themselves sometimes provoked it by entering churches and interrupting services. They cite the words of Scripture (Matt. v. 34) as to oaths, and also as to the unlawfulness of war (Matt. v. 39, 44, etc.). During the Commonwealth and the Restoration period Quakers were punished by mutilation and banishment; 5,000 were imprisoned under Charles II. The Toleration Act (1689) allowed them to hold meetings after signing a confession of Christian belief,

a declaration against transubstantiation, and a promise of fidelity to Government. Their objections to the payment of tithes and to oaths have been met by the conversion of the former into rent-charge and by an Affirmation Act. Their own ministers are not paid, but receive hospitality. There has been in the present century a serious schism among the Quakers. It is called the Hicksite movement, from Elias Hicks, who in 1827 denied the divinity of Christ and the orthodox view of inspiration. About half the sect in America followed him. This was followed by a movement in England under Joseph John Gurney, who advocated doctrinal education and the relaxation of some Quaker practices. The orthodox in America took alarm at this, and John Wilibur formed a sect in which the strictest traditions of the Society were adhered to. Wealth has to some extent undermined their strictness, if not their simplicity. Monthly meetings of the Society are held for educational and charitable purposes, and to deliberate upon the admission and correction of members, and the appointment of ministers. Preparative meetings get ready the business for the monthly, and the business of the latter is revised and controlled by meetings held quarterly. These last report to yearly meetings, which exercise a general supervision over the affairs of the Society. The Friends number at the present time about 120,000, of whom 90,000 are in the United States. Among their leading names have been Robert Barclay, author of a *Catechism and Confession of Faith* (1673); William Penn, founder of Pennsylvania; Elizabeth Fry, the prison philanthropist; and John Bright. Fox's *Journal* gives an account of the early days of the Quakers; Sewel's *History* of them was published in 1722; and Mr. Storrs Turner's recent work (1890) surveys and criticises their history and opinions from their origin till the present day.

Fries, ELIAS MAGNUS, born at Småland, Sweden, in 1794, was early led to the pursuit of botany by his father, an intelligent pastor. At the age of 12 he discovered a new fungus, *Hydnium*, and henceforward he devoted himself chiefly to studying the cryptogamia, upon which he wrote many learned treatises, not, however, neglecting other varieties of the Scandinavian flora. After graduating at the university of Lund, he became professor in 1824, and ten years later was transferred to Upsala, which he represented in the Riksdag. He was elected a foreign member of the London Royal Society in 1875, and died in 1878.

Fries, JACOB FRIEDRICH, was born at Barby, Saxony, in 1773, and brought up by the Moravians. He studied philosophy at Leipsic and Jena, and began to lecture on the subject in 1801, adopting the theory of Kant, with certain modifications of his own. Whilst accepting the division of knowledge into an *à priori* and an *à posteriori* element, as propounded in the *Kritik*, he treated the former as consisting of the mere irreducible factors that defy our processes of psychical analysis. Moreover, he regarded the understanding as in itself a mere instrument of proof devoid of all antecedent

principles of knowledge. These views he elaborated in a series of works, of which his *New Critic of Pure Reason*, his *System of Logic*, and his *System of Metaphysic* are the best known. In 1806 he received a chair at Heidelberg, returning to Jena in 1816, and continuing his teaching until his death in 1843, though he was for a period placed under an interdict, owing to his supposed democratic leanings.

Friesland or VRIESLAND, the most northerly province of Holland, lies upon the shore of the Zuyder Zee and North Sea, and is bounded inland by the provinces of Drenthe, Groningen, and Over-Yssel. It has an area of 1,281 square miles, being, for the most part, flat and below the level of the sea, which is kept out by huge dykes. The soil consists largely of sandy heaths, diversified by lakes, peat-bogs, and a few forests. The pastures in the N. and W. support herds of cattle, the principal source of prosperity, except fishing and flax-growing. The province, which includes the islands of Ameland, Terschelling, and Schiermonnikoog, is composed of three divisions—Leenwarden, Heerenveen, and Sneek. Besides the capital, Leeuwarden, the chief towns are Harlingen, Sneek, Bolsward, and Dokkum. [FRISIANS.]

Frieze (French *frise*; Ital. *fregio*, ornament) is, in classical architecture, the part of the entablature between the cornice and the architrave; but the term is sometimes used of any ornamented horizontal band.

Frigate, a vessel of war carrying all her guns on her main-deck, quarter-deck, and fore-castle, commanded by a post-captain, and rigged as a ship. She mounted from 20 to 50 guns. The modern equivalent of frigates, which were the eyes and scouts of a fleet, are cruisers. The first frigate, properly so-called, in the English navy was the *Southampton*, 32, built in 1757; but vessels loosely named frigates were common from the time of the Dutch wars. The term then signified merely a light, fast type of cruiser.

Frigate Bird (*Fregata*), a genus of tropical and sub-tropical web-footed birds. The strong, hooked bill is longer than the head; wings long and pointed; tail of twelve feathers deeply forked. *F. aquila* is generally distributed in tropical regions; length about 40 inches, dusky above, white below. The under surface is darker in adult males, and they have a distensible, orange-coloured gular sac. *F. minor* is confined to the Eastern seas, and is very numerous in Torres Straits. Both species are very strong on the wing.

Frilled Lizard. [CHLAMYDOSAURUS.]

Fringes, in the various phenomena of diffraction, mean edgings of colour between light and shade, that may be produced by small screens in the path of light or by small beams of light admitted through orifices in larger screens. The corpuscular theory of light advocated the rectilinear propagation of light corpuscles, and so explained the definite line of demarcation between light and

shadow, when any opaque obstacle was placed in the path of a beam of light. It denied the possibility of light travelling round corners in a homogeneous medium, and its supporters showed the apparent invalidity of the wave theory by pointing out that waves, such as those of sound in air or water, will travel round corners. The wave-theorists showed by these fringes that light did travel round corners, though not to the same extent as sound-waves by reason of the great difference in the wave-lengths in the two cases. A simple case of formation of diffraction-fringes may be seen when the eyes are directed towards the sun, and so nearly closed that the eyelashes come down in front, and form a sort of grating of fine threads. These act as screens from the light, but, instead of seeing so many black lines of shadow, a series of bands of colour are seen. The colour exists in those parts in the shadow of the lashes, and is thus separated because of the different powers of the different colour constituents of the sunlight to be deflected round the corners presented by the grating.

Fringillidæ. [FINCH.]

Frisians, an historical Low German people, whose descendants still occupy much of the Dutch provinces of Friesland and Groningen, the neighbouring Prussian district of East Friesland with all the adjacent islands, and the North Frisian Archipelago on the west coast of Schleswig-Holstein. Their domain formerly comprised most of the coastlands along the shores of the German Ocean between Denmark and South Holland, and extended southwards to the Rhine estuary. Many Frisian tribes took part in the Germanic invasion of Britain in the 5th century, and the Frisian element undoubtedly enters largely into the constitution of the present populations of Great Britain. Kent, the Isle of Wight, Hampshire, and some other districts farther north are supposed to have been mainly re-peopled by Frisian immigrants, and the Frisian language still shows marked affinities to the provincial dialects as far north as Northumbria. During the long struggle (6th to 9th century) between the Franks and Saxons the Frisians formed part of the Saxon League, but after the defeat of their last king, Radbod II., who took refuge in Denmark, they were incorporated in the empire of Charlemagne (775). On the reduction of the Saxons and the conversion of their king, Witikind, to Christianity (805), the Saxon and Frisian territories were divided into administrative districts (*gaue* or *pagi*) under the Frankish Empire. But all the Frisian states, whose delegates met annually near Aurich in the present province of Hanover, continued to enjoy practical "Home Rule" till 1522, when they were forced to recognise the authority of the German Emperor, represented by Charles of Austria, Count of Holland and Zealand. Since 1579, when the West Frisians joined the Union of Utrecht, the western section of the nation has followed the destinies of Holland, and here its racial purity, language, usages, and traditions have been best preserved. The Frisians are distinguished from their Dutch neighbours by their taller stature,

slimmer and more shapely figures, more oval features, much lighter and more florid complexion with light blue or grey eyes and flaxen or brown hair. Most of them are now bilingual, speaking both Dutch and a very pure dialect of the Old Frisian, which differed in several marked respects from Anglo-Saxon, Continental Saxon, and other neighbouring members of the Low German linguistic group. It is still (1890) the mother tongue of about 800,000 persons, of whom 600,000 are West Frieslanders (Holland) and 200,000 East Frieslanders (Germany and the islands). (Rask, *Frisisk Sproglaere*, 1825; Wiarde, *Geschichte der Ost-Friesländische*, 1817; Lubach, *Les Habitants de la Néerlande*, in *Bull. de la Soc. d'Anthropologie*, iv., 1863.)

Frith, JOHN, one of the forerunners of the Reformation in England, was the son of an inn-keeper at Westerham, Kent, and must have been born early in the 16th century. Educated at Eton and King's College, Cambridge, he was invited by Wolsey to transfer himself to Cardinal's College, Oxford. His avowed sympathy with the German heretics led to his imprisonment. Wolsey got him released, and he went to Marburg where he remained until 1532, writing several controversial works. On his return he was seized by Sir Thomas More, and thrown into the Tower. He might have escaped with his life, but the treacherous disclosure of a "lytle treatise" on the Sacraments roused the king's attention, and Frith was burned at Smithfield in 1533.

Frith, WILLIAM POWELL, R.A., born at Studley, near Ripon, in 1819, began to study painting under Sass in 1835, and four years later exhibited his first picture at the British Institution. In 1845 *The Village Pastor* marked his first attempt to reproduce the aspects of contemporary English life. It won for him the associateship of the Royal Academy. His *English Merrymaking a Hundred Years Ago* and his *Coming of Age in the Olden Time* added to his popularity, so that in 1851 he was elected R.A. *Ramsgate Sands* (1854), *The Derby Day* (1858), *Claude Dural* (1860), *The Railway Station* (1862), and *The Marriage of the Prince and Princess of Wales* (1865), painted for her Majesty, brought Mr. Frith to the zenith of his fame, when the largest price ever paid till then for the work of a living artist was given for his Johnsonian group exhibited in 1868 and sold in 1875. *Charles II.'s Last Sunday*, *A Private View of the Royal Academy*, *For Better for Worse*, *Dr. Johnson's Tardy Gallantry*, and *The Road to Ruin* are among his later productions, which have suffered by the change of public taste, though they are in no way inferior to his earlier achievements. Mr. Frith retired from the active duties of an Academician in 1890, and has during his later years published four pleasant volumes of autobiography.

Fritillaries, a group of butterflies, of which the most typical belong to the genus *Argynnis* and the family *Nymphalidæ*; as a rule, they are brown, speckled with black, with spots of brilliant silver on the under side of the hind wings. The genus occurs in Europe, Asia, and North America. The

Duke of Burgundy Fritillary belongs to a different family, but there are seven English species of the typical group.

Fritillary (from the Latin *fritillus*, a dice-box) is the English name of *Fritillaria Meleagris*, a somewhat local liliaceous plant, growing in water-meadows, with pendulous bell-shaped flowers, which, though sometimes white, are generally of a dull red chequered very regularly in two shades of that colour. The flower is also popularly known as "snakes'-head" or "Turk's-cap." Another species of the same genus is the Crown-Imperial (q.v.).

Friuli (ancient *Forum Julii*), a district that lies at the head of the Adriatic, the eastern portion belonging to Austria, and having Trieste as its chief place, whilst the western division falls within the Italian province of Udine. The whole of this territory, which formed under the Romans part of Gallia Transpadana, was erected into a Lombard duchy, and ultimately conquered by Charlemagne. His successors assigned it to the Archbishops of Aquileia, but the Venetians were called in by the local aristocracy, and seized the land for themselves. The Counts of Görz, however, continued to occupy the eastern extremity until Maximilian I. incorporated it with Austria. The Venetian share was acquired by the emperor through the peace of Campo Formio (1797), but was taken again by Napoleon in 1805, when Duroc was made Duke of Friuli. In 1814 Austria once more resumed possession of both parts, but ceded the western half to Italy at the treaty of Nicolsburg (1866). The territory still retained constitutes the *Italia Irredenta* that from time to time threatens the peace of Europe.

Frobisher, FORBISHER, or, and more properly, FROBISER, SIR MARTIN, sailor and navigator, was born about 1535, and, after several years of adventurous trading in the Levant and on the coast of Africa, commanded three several expeditions in search of a north-west passage, the first setting sail from Blackwall in 1576. He was captain of the *Primrose* in Drake's voyage to the West Indies in 1585, and of the *Triumph* against the Armada in 1588. For this last service he was knighted by the Lord Admiral on the deck of the *Ark Royal*. In 1590 he served under Hawkins in the expedition to the coast of Portugal; and in 1594, having been mortally wounded in an attack on Crozon, near Brest, he died at Portsmouth. He is buried in St. Giles's, Cripplegate. Frobisher Strait, one of the entrances to Hudson's Bay, was discovered by him. He also visited and charted some of the west coast of Greenland.

Froebel, or FRÖBEL, FRIEDRICH WILHELM AUGUST, was born near Blankenburg in Thuringia in 1782. His early career included some years of military service. In 1826 he published his views on education, since so widely adopted, in a work entitled *Die Menschenziehung*. Ten years later he established at Blankenburg the first Kindergarten, afterwards moving to Marienthal, where he died in 1852. His idea of combining physical, moral, and intellectual training in a system which

should be applicable without pain or fatigue to children from the tenderest age, was derived from Pestalozzi. Though Fröbel was ridiculed in his lifetime, his principles have steadily gained ground, and a society bearing his name has been founded for their advancement.

Froebel, JULIUS, nephew of the above, was born in 1805. He made his mark first as a man of science, and became in 1833 Professor of Natural History at Zürich, where he published a treatise on crystallography. Holding strong democratic views, he promoted the Revolution of 1848, entered the Frankfort Parliament, accompanied Blum to Vienna, and was arrested. On his liberation he went to America, and subsequently settled in London, having been forbidden to return to Germany. He is the author of several works advocating Republicanism, but opposing Socialism, and has written an account of his American experiences.

Frog, any individual of the genus *Rana*, with 60 species, the type of a family (Ranidæ) of tailless Amphibians, containing 26 genera, with 150 species, almost cosmopolitan, and the genus is nearly as wide in its range, being absent only from South America and Australia. The name is also given to allied forms, as to the Obstetric Frog (*Alytes obstetricans*), a European species, in which the eggs are attached to the thighs of the male, which seeks the water just as the young tadpoles are about to come out. [TREE-FROG.] The Common Frog (*R. temporaria*) is found near ponds, rivers, and in marshy places all over the British Islands, and has a wide range in Europe and Asia. The male is larger than the female, and the extreme length does not exceed $2\frac{1}{2}$ inches. There are four digits on the fore limbs, and five, united by a membrane, on the hind limbs, which are long and muscular, enabling these animals to take wonderful leaps. The colour is generally greenish-brown, marked with black, but alterations in the pigment cells of the skin admit of some change, and the limbs are cross-barred. The tongue is fixed in the front of the mouth, and free behind, so that it can be thrown rapidly forward, and when the prey—insects, small worms, or slugs—is secured by the viscid secretion with which it is covered, it is then so rapidly retracted that the eye can scarcely follow it. The peculiar angle in the back of the frog is caused by the fact that only the eight anterior vertebræ are separate, the rest being consolidated into one bone called the urostyle. In winter frogs undergo hibernation, generally in the mud at the bottom of ponds. The Green or Edible Frog (*R. esculenta*) has a wider geographical distribution, though it is extremely local in England. There is no black mark from the head to the shoulder, as in the Common Frog, but a light-coloured streak runs down the back. The male has large vocal sacs, and his note is much louder than that of the Common Frog, in which these dilatable sacs are absent. The name "Cambridgeshire Nightingales" is sometimes given to the edible frogs found in Foulness Mere, from their habitat and their loud croaking, just as in Holland these frogs are called "Dutch Nightingales." The hinder legs are the part generally eaten, and they

are said to resemble spring chicken in flavour. Professor Mivart calls the Frog "a martyr to science," and in this fact lies its chief interest. It is the animal on which students generally begin their dissection of vertebrates; in its transparent feet the circulation of the blood can be conveniently observed under the microscope; and to watch its development from the egg through its larval metamorphosis to the perfect animal is a practical lesson in Evolution. The larva or tadpole begins its career as a limbless, fish-like creature, living in the water, and breathing by gills; the mature form is a normal, four-limbed vertebrate, breathing by lungs. This development also throws some light on the question of what determines sex, for, by high feeding, the proportion of females to males in a hundred tadpoles has been raised from 56 to 92 per cent. [TOAD.]

Froghoppers, a number of small insects, belonging to the Homoptera (q.v.) and the family *Cercopidae*. The best-known English species is the "cuckoo-spit"; this is a small yellow insect with two pale bands on the fore wings; it surrounds its larva by a frothy mass, which is common on grass and bushes.

Frogmore, a mansion between the Home Park and the Great Park, Windsor, built by James Wyatt about 1800, and occupied from 1840 to 1861, the date of her death, by the Duchess of Kent, Queen Victoria's mother. Here she died, and the Prince Consort having passed away in the same year, her Majesty caused a mausoleum to be erected in the grounds. Besides these monuments, the estate contains the royal garden and dairy. Frogmore House lies low, and is seldom occupied.

Froissart, JEAN, born at Beaumont, near Valenciennes, about 1337, his ancestors being of the *bourgeois* class. At what precise time he became a cleric cannot be ascertained. It was as a layman that he was sent, at the age of eighteen, to the court of Queen Philippa in England, whither he returned again in 1361, after diplomatic errands to Avignon and Paris. He appears to have been a favourite with Edward III.'s romantic queen, who encouraged his literary tastes and sent him to Scotland with a view to collecting materials for his rhymed chronicles. On his return he became secretary to the captive King John of France, and began to store up that curious fund of gossip information which was to delight and instruct posterity. Leaving England in 1366, he went to Brussels, to Brittany, and to Bordeaux, everywhere "interviewing" the chief actors in the great events of the day. He accompanied the Black Prince as far as Dax, but, being entrusted with a mission to England, formed part of the retinue that escorted Lionel of Clarence to Milan, travelling thither with Chancer and meeting Petrarch at the wedding-feast. Thence he passed to Bologna, where he joined the suite of Peter, King of Cyprus, and visited Venice, going on later to Rome, where the news of Queen Philippa's death gave him a deep shock. He now made his way back to his own country, and found new

patrons in Yolande de Bar and the Duke of Brabant. For some years he settled down as a country priest in the village of Lestines, near Buiche, but, falling in with Gui, Count of Blois, was induced by him to set seriously to work on a prose history of his times, and ultimately received from his protector a canonry at Chimay. In 1386 he accompanied Gui to Blois, and journeyed next to Sluys in order to witness the preparations for a naval attack on England, and to gather matter for the Flemish part of his history. At the age of 51, but full of vigour and spirits, he set out for a tour through Berry, Auvergne, and Languedoc, ultimately attaching himself at Orthez to the generous and brilliant Gaston Phœbus, Count of Foix. On his way back to Valenciennes, where he completed his fourth book, he was present at the marriage of the Duc de Berri with Jeanne de Bourbon and at the reception of Isabeau of Bavaria in Paris. Gui de Blois had now fallen into poverty and evil habits; so Froissart transferred his allegiance to Robert of Namur, to whom he dedicated his *Chronicles*. After forty years' absence, he visited England once more, to find all his old friends gone, but to make a new one in Richard II. and to glean much useful information. He reappeared in France just before the Comte de Nevers set forth on his abortive crusade, the story of which forms almost the last chapter of the *Chronicle*, though the closing words recount the death of Richard II. in 1400. After this the fate of the historian himself becomes obscure. Tradition asserts that he died in utter poverty ten years later at Chimay, and was buried in the church of St. Monegunda. Froissart took more pride, no doubt, in his poetry than in his prose, but the samples of his verse that have been published hardly commend themselves to the critical taste of later generations. His prose style, on the other hand, is remarkably vivid, simple, and effective, whilst the picture that he gives of the men and manners of the 14th century is unrivalled in accuracy and good faith.

Fromentin, EUGÈNE, was born at La Rochelle in 1820, and studied landscape painting under Louis Cabat. *Les Gorges de la Chiffa* in the Salon of 1847 brought him at once into notice, and among many other works of succeeding years may be mentioned his *Enterrement Maure*, *Voleurs de Nuit*, *Halte de Muletiers*, *Birouac Arabe*, and *Fauconnier Arabe*, the last of which is in the Luxembourg Gallery. Equally skilful with the pen as with the brush, Fromentin produced several charming volumes of fiction and travels. *Dominique* appeared in the *Revue des Deux Mondes* in 1862, having been preceded by *Visites Artistiques*, *Simplex Pèlerinages*, *Un Été dans le Sahara*, *Une Année dans le Sahel*. He died suddenly at La Rochelle in 1876.

Fronde, the name given to a political party in France, which, during the minority of Louis XIV., resisted the tyrannical government of the Prime Minister, Cardinal Mazarin. Mazarin, himself an Italian, made himself odious to the nobility by the favour he showed to foreigners, especially his

agent, Emeri, to the people by his burdensome taxation, and to the Parlement of Paris by forcing them to register his financial edicts. *Fronde* was the name of a sling used by the urchins of Paris in their street squabbles; *frondeur* denoted a "grumbler" as well as a "slinger," and it was perhaps in this sense that the name was adopted by the leader of the party, Paul de Gondy, Cardinal de Retz. Mazarin having in 1648 arrested certain members of the Parlement, who had caused the downfall of Emeri, the Parisian mob took up arms and forced the Minister and the queen-mother, Anne of Austria, to fly to Ruel, and afterwards, in 1649, to St. Germain. The Parisians were joined by De Retz, the Duc de Longueville, Turenne, and other nobles, but the Court party were saved by Condé, who besieged Paris, and a compact signed at Ruel in April closed the struggle of the Old Fronde. The New Fronde arose simply out of the personal dislike of the great nobles for Mazarin, whom they sought to overthrow by intriguing with Spain. Condé, Conti, and Longueville were arrested in January, 1650, but Turenne marched towards Paris with a force of Spaniards. His defeat at Rethel (December) and the mutual distrust of the leaders led to the breaking up of the party. The Frondeurs returned to their allegiance, with the exception of Condé, who was defeated by Turenne near Paris (July, 1652), and at last sought refuge in Spain. The declaration of a general amnesty (1653) was followed by the return of Mazarin and the complete triumph of the royal power.

Frontenac, LOUIS, COMTE DE, was born in 1621, and, having entered the French army, became, after a distinguished military career, Governor-General of Canada in 1678. He built Fort Frontenac on Lake Ontario, was recalled to France in 1682, and died in 1698.

Frost means the condition of temperature when below the freezing-point of water. The average temperature at any spot in the British Isles is for no part of the year below freezing-point (32° Fahr.), though exceptional circumstances may bring about a period of frost extending over a large area for several days in succession. Such weather is usually settled, with high barometer and little wind. The ground in a given locality may be warm, but the air above it below freezing-point. This is the case when the growing warmth of early morning causes the heating of the layers of air nearest the ground, and a slow flow downwards of the colder upper layers. Conversely, the air may be above 32° Fahr. and the ground below that temperature, as when rapid radiation after sunset from the earth into a clear atmosphere above causes the earth to cool faster than the air. If there is but little water-vapour in the air under such conditions, the dew-point (q.v.) may be below 32° Fahr., and, that temperature being attained at night-time, dew will be deposited in the crystalline solid form. This is known as *hoar-frost* (q.v.).

Frost-bite. The circulation of the blood in the more exposed parts of the body may be so obstructed by subjection to the influence of extreme

cold, and the vitality of the tissues of the affected parts may become so depressed, that a localised mortification or *gangrene* (q.v.) results. The mortification may be the immediate effect of the exposure to cold, or may be consecutive to the inflammatory reaction which is set up in the benumbed tissues. The symptoms do not essentially differ from those of gangrene arising from other causes; if the injury to the parts be considerable, there is an actual "slough" formed, a "line of demarcation" being set up between the living tissues and those which have perished. Frost-bite is rare in Britain, though it may occur in poorly-fed and badly-clothed persons, who are exposed to extreme cold; it has been known on the Continent, however, to work great havoc in the case of an army undergoing a winter campaign. In cases of threatened frost-bite it is important not to apply warmth too suddenly to the injured part. Rubbing with snow has been found useful; and, as soon as practicable, the application of cotton wool or flannel should be resorted to, and absolute rest enforced, while the gradual re-establishment of the circulation is encouraged. If heat is applied at once, inflammatory reaction is apt to occur, and gangrene may result.

Froude, JAMES ANTHONY, was born at Dartington, Devon, in 1818, being the youngest son of the Archdeacon of Totnes. From Westminster he went to Oriel College, Oxford, where his brother, Hurrell Froude, was in the thick of the Tractarian movement, with which he for a time also associated himself. He was elected to a fellowship at Exeter College, and in 1844 was ordained a deacon. A change, however, was coming over his religious views, and the publication in 1848 of *The Nemesis of Faith* led to his resignation of his fellowship and the abandonment of teaching as a career. He now joined the staff of the *Westminster Review*, devoting himself also to the collection of materials for his great work, *The History of England from the Fall of Wolsey to the Defeat of the Spanish Armada*. The first instalment of the book appeared in 1854, and the twelfth and concluding volume was published in 1870; some of his views—especially as to the elevated character and policy of Henry VIII.—proved unacceptable to popular taste, whilst the inaccuracy of his statements of fact arrayed against him the great majority of professed historians. In the meantime Mr. Froude had reprinted a selection of his most brilliant essays under the title of *Short Studies on Great Subjects*, and had accepted the editorship of *Fraser's Magazine*. In 1872 he took advantage of the new Act to rid himself of his deacon's orders, and he spent some time lecturing in the United States in support of Protestant ascendancy in Ireland. The pith of these discourses furnished a book on *The English in Ireland in the Eighteenth Century*. Lord Beaconsfield sent him in 1874 to South Africa with a view to investigating the causes of Kaffir discontent and formulating a scheme of Colonial federation. Very little resulted from his visit except *Two Lectures on South Africa*. Biographical sketches of Julius Cæsar, John Bunyan, and Thomas à Becket, with some pages of memories of the High Church movement,

were all that he gave to the world during the five years preceding 1881, when, as literary executor of Thomas Carlyle, he brought out a history of the first forty years of that sage's life. Two further volumes of *Reminiscences* were followed next year by the *Letters and Memorials of Jane Welsh Carlyle*. The revelations made in these volumes gave rise to much bitter controversy. *Oceana* came out in 1886, and two years later he took for his theme *The English in the West Indies*. A novel, *The Two Chiefs of Dunboy*, was published in 1889, whilst *A Life of Lord Beaconsfield* appeared in 1890. In 1892 Lord Salisbury appointed him to succeed his chief antagonist and critic, Mr. E. A. Freeman, as Regius Professor of Modern History at Oxford.

Froude, RICHARD HURRELL, the eldest brother of the historian, was born in 1803, and went from Eton to Oriel College, Oxford, where he became fellow and tutor. A close friend of Newman and, Keble, he entered with ardour into the Tractarian movement, and wrote Nos. IX. and LXIII. of the *Tracts for the Times*. His impressionable nature, wrought to feverish excitement by the consumptive tendencies that undermined his health, carried him more rapidly forward than his contemporaries, and the publication of his writings after his premature death, in 1836, gave a more distinctly Romanising aspect to the Oxford reform than it had as yet assumed.

Froude, WILLIAM, brother of both the foregoing, was born in 1810, and, after being educated at Westminster and Oriel, where he took a first class in mathematics, adopted the profession of civil engineer. As Mr. Brunel's assistant, he helped to make the Bristol and Exeter Railway, but retired in 1846 from the active exercise of his profession, and devoted himself to investigating the laws that govern the stability of ships and the best means of overcoming the resistance to speed offered by the friction of water or air. A long series of experiments led him to conclusions that have been of the highest value to naval constructors. He was consulted by the Admiralty, especially as regards the building of the *Derivation* and the *Inflexible*, and served on the committee of 1871 to inquire into the designs of ships of war. He died in 1879.

Fructose. [LEVULOSE.]

Fruit, a term used generally in a very loose sense for the structures that follow the flower in the higher plants, especially when they are succulent or sweet, and sometimes extended even to other parts of the plant. A strawberry, a mulberry, a fig, or a pineapple are usually called fruits, and even a tart made from the leaf-stalks of the rhubarb is sometimes thought of as a fruit-tart, whilst we hesitate to apply the term fruit to a nut, a pea-pod, a grain of corn, a poppy-head, or a vegetable marrow. Botanically, however, a fruit may be best defined as the fertilised gynæceum of a flower, together with those adjacent structures (belonging to the same flower) that enlarge and adhere to it in consequence of fertilisation. Such "polythalamie" structures as the mulberry, the fig, and the pine-apple, which not only involve other parts than

the gynæceum, but are also each made up of many flowers, may well be kept apart under the name of *infructescences* (q.v.). Among "monothalamie" structures—i.e. those formed from a single flower, we may distinguish *true fruits*, those consisting solely of gynæceal structures, from *pseudocarps*, those to which other parts contribute. The walls of the fertilised ovary in the former are termed the *pericarp*, and this consists of three layers often readily distinguishable, the *epicarp* (q.v.), *mesocarp* (q.v.), and *endocarp* (q.v.). In pseudocarps the other structures contributing to the fruit are mainly derived from the floral receptacle. In the strawberry (q.v.), for instance, the numerous carpels, constituting the apocarpous (q.v.) and polycarpellary gynæceum are scattered spirally over a fleshy outgrowth from the conical white receptacle. No such structure is present in the buttercup or the raspberry, or even in the closely-related genus *Potentilla*. In the rose (q.v.) the dry, apocarpous, one-seeded carpels are enclosed in a red, fleshy, urn-shaped, receptacular tube. In the apple, the cucumber, and all fruits formed from "inferior" ovaries, the true fruit or gynæceum is surrounded by the adherent receptacular tube, which often forms much of the fleshy portion. The terms pericarp, epicarp, mesocarp, and endocarp can hardly be properly applied to these pseudocarpic structures.

After fertilisation (q.v.), or even after pollination, the ovary or ovaries commonly increase in size; and, whilst the petals, stamens, and sometimes the sepals, fall off, nourishment is determined towards the gynæceum. This enlargement of the ovary sometimes takes place, mainly among cultivated races of plants, without fertilisation, as in the sultana raisin and in the seedless varieties of the apple and of the Maltese orange. In annuals, biennials, and those other plants, such as *Aloë* and *Agave* (q.v.), which, producing only one crop of flowers and fruit in their lives, are termed *monocarpic*, as the fruit ripens the whole plant withers, exhausted by the great physiological effort of seed-production. In ripening, the ovary or other structures either dry up or wither, like autumn leaves, or become fleshy. In the former case the fruit, if containing more than one seed, is commonly *dehiscent*, splitting, that is, either into one-seeded portions or *cocci*, which do not themselves split [SCHIZOCARP], or so as to discharge its seeds. Fleshy fruits, on the other hand, are mainly *indehiscent*. They commonly change colour, turning from green to some shade of red, yellow, or, more rarely, purple, by modification of their chlorophyll (q.v.), and at the same time convert much of their acid contents into sugar.

Some fruits are furnished with wing-like projections of the pericarp [SAMARA], and others with a "pappus" of hairs [CYPSELA], by means of which they are carried by the wind beyond the stifling shade of the parent plant. Some dehiscent fruits—such as those of the balsams, and, to a less extent, broom and furze—split so elastically as to throw their seed some little distance. Fruit-eating birds do not, as a rule, have muscular gizzards, and frequently swallow seeds whole and pass them undigested; but, whilst their seeds are almost always

indigestible, succulent fruits, such as apples, are attractive to other animals besides birds—deer, for example. Even the dry fruits of grasses have been observed to be thus disseminated, after being swallowed, by locusts. Many fruits are furnished with curved hooks, which become entangled in the wool or hair of animals, and may thus cause them to be conveyed long distances; whilst the stony pericarp of some fruits will for some time resist the action of sea-water.

Fruits have been variously classified, and a great variety of names applied to the different forms, many of which can, however, be neglected, as only of exceptional application. No classification can hope to be altogether natural, since succulence and such types as the capsule have undoubtedly originated more than once in independent groups. Omitting exceptional cases, the following strictly morphological classification of the chief forms, most of which are described under separate headings, may be adopted. Less common fruits, not falling under one of its headings, may be described by derivative adjectival terms, such as *drupaceous*, *capsular*, *samaroid*, etc.

MONOCARPELLARY (of one carpel)—

- Dry. 1. Legume (*Leguminosæ*).
Succulent. 2. Drupe (*Drupaceæ*).

POLYCARPELLARY (of more than one carpel)—

(a) **Apocarpous** (with distinct carpels)—

3. Etærio : i. of folicles (*Magnolia*).
ii. of achenes (*Ranunculus*, rose, strawberry).
iii. of drupels (*Rubus*).

(b) **Syncarpous** (with united carpels)—

* **Superior**—

Dry—

- Dehiscent, exposing seeds ... { 4. Silique (*Cruciferae*).
5. Capsule.

- Dehiscent, not exposing seeds 6. Regma, or superior Schizocarp (*Geranium*).

- Dehiscent, winged ... 7. Samara (Maple).

- Indehiscent ... 8. Caryopsis (Grasses).

- Succulent ... 9. Nuculane, Uva, or superior Berry (Grape, Orange).

** **Inferior** (necessarily more or less pseudocarpic)—

Dry—

- Dehiscent, exposing seeds ... 10. Diplotegium or inferior capsule (*Iris*).

- Dehiscent, not exposing seeds 11. Cremocarp, or inferior Schizocarp (*Umbelliferae*).

- Indehiscent ... 12. Cypsela (*Compositæ*).
13. Nut (*Cupuliferae*).

Succulent —

- Thin-skinned ... 14. Berry (Gooseberry).

- Thick-skinned ... 15. Pepo (*Cucurbitaceæ*).

- With a core ... 16. Pome (*Pomaceæ*).

Here the first nine types are all superior, and almost exclusively gynæceal in structure; in the first three there is no cohesion of carpels; in each subdivision the simpler dry types precede the succulent, and the more dehiscent precede the less. Perhaps it might be well to lump the silique with the capsule, the winged samara with the unwinged regma, and the cypsela with the very slightly differing nut; but, as shown by the examples named in the table, these types are characteristic of important natural orders, and their names are in familiar use among systematists.

Fruit Bat. [BAT, FLYING FOX.]

Fruit Pigeon, any bird of the genus *Carpophaga*, with 50 species, from the Oriental and Australian regions.

Fruit Sugar. [LEVULOSE.]

Fruit Trees and **Fruit Growing.** [HORTICULTURE.]

Frumentius, the founder of the Christian Church of Abyssinia, and known to his followers in that country as Abba Salama, "Father of Salvation," is a personage of whom little is known. According to tradition, he went out to India with two other missionaries about the middle of the 4th century, and obtained the favour of the king of that uncertain region. Returning to Alexandria, he was consecrated Bishop of Axum in Abyssinia by Athanasius, who mentions this fact in his letters. Some have thought that South Africa was the field of his labours, but there is little evidence to controvert the direct statement of Athanasius himself.

Frustum, in solid geometry, signifies that portion of a solid contained between any two planes of section. In the case of a cone or other pyramid the base forms one plane of section, the other being taken anywhere between the base and the apex; the term is still further particularised, if no inclination of the second plane of section is mentioned, to refer to that portion between the base and any plane section *parallel* to the base. A frustum of a sphere or other conicoid similarly means the volume between any pair of parallel plane sections.

Fry, MRS. ELIZABETH, the daughter of John Gurney, a wealthy Quaker of Norwich, was born in 1780. At the age of eighteen her religious fervour was roused by the preaching of Savory. She married Joseph Fry, a London merchant, in 1800, and, though she had a large family, contrived to devote much of her care to the poor of her neighbourhood. Her charity and her simple eloquence won for her the position of minister amongst the Friends. About 1813 her attention was directed by Howard's example to the appalling features of prison life. Four years later she established the Association for the Improvement of Female Prisoners in Newgate, and in 1819, together with her brother, Joseph, visited the criminal establishments in the north and in Scotland. Her benevolent work was recognised by Parliament, and soon bore excellent fruit. In 1827 she made a tour of inspection in Ireland, and extended her observation to lunatic asylums and hospitals. The whole of Europe now awoke to its responsibilities, and from 1838 to 1842 Mrs. Fry was engaged in inquiries, which took her over France, Switzerland, Belgium, Holland, Prussia, and Denmark. Unremitting toil then told upon her health, and in 1845 her noble life of self-sacrifice was brought to an end. Her *Memoirs, Journals, and Letters* were edited in 1847 by two of her daughters.

Fryxell, ANDERS, was born in Dalsland, Sweden, in 1795. He graduated at Upsala, entered the pastorate, and adopted education as his profession. His first published work was entitled *Svensk*

Språklera, but his fame chiefly rests on his *Berättelsre ur Svenska Historien*, which appeared in parts for upwards of five-and-twenty years, and at once achieved popularity. From 1833 to his death in 1881 he was professor at Upsala, and also parish priest of Sunne.

Fuad Pasha, MEHMED, born at Constantinople, in 1814, of wealthy and distinguished family, was compelled, owing to the confiscation of his father's property, to adopt a profession. Having studied medicine, he obtained a post in the Admiralty, but abandoned it to enter the diplomatic service. He served as first secretary in London from 1840 to 1843, and, after filling several other positions with credit, became Foreign Minister in 1852, resigning next year owing to a misunderstanding with Prince Menschikoff as to the Holy Places, which ultimately resulted in the Crimean War. He served as Commissioner with Omar Pasha's army, but in 1855 resumed his charge of the Foreign Office. President of the Tanzimat in 1857, he was sent in 1860 to make peace between the Druses and Maronites, and soon after was made Grand Vizier. In 1867 he visited England in the suite of the Sultan, and in 1869 he died at Nice.

Fuca, THE STRAITS OF ST. JUAN DE, connect the Pacific Ocean with the Gulf of Georgia, S. of Vancouver's Island. The channel was for long supposed to lead into the North Atlantic, but Vancouver, at the end of the 18th century, set the question at rest. These straits form part of the boundary between the United States and British North America, and in 1872 the Emperor of Germany, as arbitrator, assigned the Island of St. Juan to the first-named Power.

Fuchsia, a genus of plants, comprising upwards of 50 species, belonging to the order *Onagraceæ*, named by its discoverer, Plumier, after the German botanist, Leonhard Fuchs (1501-1566). They have simple leaves, usually in opposite pairs; pendulous flowers with an inferior ovary; a funnel-shaped, coloured, deciduous calyx of four valvate sepals; four perigynous, convolute petals, generally different in colour from the sepals; eight exerted stamens; a long style; and a four-chambered berry. Three species are known from New Zealand, one from the Falkland Islands, and the remainder from the forests or mountains of Chili, Peru, and Mexico. The globose-flowered *F. coccinea* was introduced into England in 1788; the long-flowered *F. fulgens* in 1837, and since then innumerable hybrids of these and other species have been raised. Fuchsias may be readily grafted, and grow to a large size and are perfectly hardy on the south-west coasts of England. The berries of some kinds are edible but insipid.

Fuchsine, a dyestuff known also under the names of *Magenta*, *Roseine*, *Ponceau*, and others. It consists of the hydrochloride (or acetate) of *rosaniline* (q.v.), and has the composition $C_{20}H_{19}N_3 \cdot HCl$ (or $C_{20}H_{19}N_3 \cdot C_2H_4O_2$). It forms fine crystals of a metallic green colour, which dissolve to a carmine red solution. The dyes, known as cerise, cardinal, and many others, contain this

substance among their constituents. For dyeing cotton, the fabric should be "mordanted" [DYEING] with tannic acid, but wool and silk require no mordant.

Fucino, or CELANO, LAKE (classic *Lacus Fucinus*), is situated in the province of Aquila, South Italy, 15 miles N. of Sora. Lying between two ranges of the Apennines at a height of 2,276 feet above the sea, and having a length of 10 miles and a breadth of 7 miles, it has always been a source of danger through inundation to the valleys below. The Emperor Claudius drew off the overflow by means of a tunnel to the river Garigliano, but this outlet became blocked, and was only cleared in 1862 at immense cost by a Neapolitan company.

Fucus, an important genus of olive-brown seaweeds, giving its name to the order Fucaceæ, and including the common bladder-wracks (*F. vesiculosus* and *F. nodosus*), which cover so large an area of the tidal rocks of our coasts. They have a flat thallus, branching in one plane, often with large air-bladders hollowed out of their tissue as floats. The only known method of reproduction is sexual, the antheridia and oogonia being, either together (monoecious) or separately (dioecious), in globular cavities, known as *conceptacles*, sunk in the warty extremities of the branches. The antheridia are lateral or branched hairs (*hyphæ*), and the protoplasm of each ovoid antheridium breaks up into numerous pointed and laterally biciliate antherozoids. The oogonia terminate short hyphæ, and their contents break up into eight relatively large oospheres. These escape from the conceptacle through its *ostiole* or mouth into the water: are impregnated by numerous antherozoids, the cilia of which impart to them for a time a rolling movement; and, acquiring a cell-wall and settling down, germinate by cell-division without any resting period. They are largely used in the manufacture of kelp (q.v.), as a source of iodine and as a manure. *F. vesiculosus* is the badge of the clan McNeill.

Fuegians, the inhabitants of Tierra del Fuego, of whom there are three distinct ethnical groups:—(1) The *Onas* in the east (King Charles South Land), who are Patagonian intruders from Argentina; (2) the *Alacalufs* in the west, intruders from the Chilian Cordilleras, and akin to the Araucanians of that region; (3) the *Yahgans* of the southern islands, who are the true aborigines of the archipelago; total population, 8,000, of whom 2,000 are Onas, 3,000 Alacalufs, and 3,000 Yahgans. Of these groups the Yahgans have come into most frequent contact with explorers, and to them alone missionary work has hitherto been extended. Hence most of the published accounts of the Fuegians refer to these aborigines, who are at an extremely low grade of culture, and of a debased physical type, characterised by small stature (4 feet 10 inches to 5 feet 4 inches), low brow, high cheek bones, flat nose, tumid lips, dark chocolate colour, loose, wrinkled skin, black, restless eyes very widely apart, coarse, black, lank hair, head and chest disproportionately large compared with the slender and outwardly

curved legs. The mental qualities are at the same low level, as shown by the brutal treatment of their women, who, when old and useless, are often eaten; by the lack of affection for their offspring, who in rough weather are cast overboard either to propitiate the storm-gods or to lighten the canoe; and by many repulsive practices connected with their food and social habits. There is no tribal or social organisation, each family circle living apart with no hereditary or even temporary chiefs. The language, which shows no affinity to any other American idiom beyond its general polysynthetic structure, has root words only for the first four numerals; it has been reduced to writing by the English missionaries, who issued a translation of St. Luke in a peculiar script in 1881. (Darwin, *Voyage of the "Beagle"*; W. Parker, *The Wild Tribes of Tierra del Fuego*, in *Transactions of the Ethnol. Soc.*, 1861; *South American Missionary Magazine*, *passim*; Lieut. Bove, in Guido Cora's *Cosmos*, 1883; A. H. Keane, art. *Tierra del Fuego*, in *Encyc. Brit.*, new ed.)

Fuels. The term "fuel" is generally understood to include all substances the combustion or burning of which is practically utilised for the production of heat. It therefore includes a large number of substances, which may be conveniently divided into *solid*, *liquid*, and *gaseous fuels*. Under the first class are included wood, peat, charcoal, coke, the various varieties of coal, together with a number of manufactured products called "patent fuel." Of liquid fuels, petroleum is by far the most important; while coal-gas, natural, and waste furnace gases are the gaseous fuels in most common usage. The value of any fuel is largely dependent upon its *calorific power*—i.e. the weight, in pounds, of water which can be raised through one degree Centigrade by the heat evolved by the combustion of one pound of the material. This is usually determined practically, but it may be generally approximately calculated from a knowledge of the chemical composition of the substance. The *calorific intensity* of a body is the maximum temperature theoretically obtainable by the combustion, and it is evident that for many purposes a high intensity is of more importance than great calorific power. It evidently depends upon the latter, but is also affected by the quantity and nature of the products of combustion, high specific heat in these products diminishing the intensity. Thus, although the calorific power of hydrogen is four times that of carbon, the intensity is much less owing to the high specific heat of the water formed by its combustion. Other considerations, however, also enter into the actual utility or value of fuels, as *e.g.* the ease with which combustion is started, and the mode in which it progresses, the size of the flame, cleanliness of the fuel, its ease of working, quantity of ash, bulk, nature of the products of combustion, and other details of a more or less practical nature.

Wood is very useful as a fuel for domestic purposes, when it can be obtained cheaply. In large towns, however, its cost and bulk render it unsuitable, while also, owing to the large amount of moisture contained, it is not well adapted for

metallurgical operations where high temperatures are required. Still in many parts of the Continent dried wood is used to a large extent even in metallurgy.

Peat is a product of the decay of plants, chiefly mosses, in marshy regions. Its composition is intermediate between those of wood and coal. Where it occurs plentifully it is frequently used, but is almost entirely restricted to these districts, and to domestic usage, for the same reasons as apply in the case of wood.

Coal, in its different varieties, as *lignite*, *bituminous*, *anthracite*, etc., forms by far the most important fuel. It is very largely employed both for household and manufacturing purposes. The composition of coal, neglecting the ash, varies from carbon 70 per cent., hydrogen 5 per cent., and oxygen 25 per cent., in lignite; to carbon 95 per cent. and hydrogen and oxygen 2.5 per cent., each in anthracite; while the quantity of the ash varies from 50 to 2 per cent.

Coke and *charcoal* are obtained by heating coal and wood respectively, without access of air. They both give high temperatures by their combustion, and burn with clear flames, depositing no soot. They are hence well adapted for metallurgical operations, in which they are largely employed, but are also used for domestic purposes, especially on the Continent.

"*Patent Fuel*." The various forms of patent fuel consist generally of "small coal," mixed with some substance necessary to give coherence to the mass. For this purpose pitch, tar, asphalt, treacle, etc., have been employed, but as yet none have proved entirely satisfactory.

Petroleum. This includes a large number of mineral oils, which occur naturally, principally in America and Russia. It is burned either in troughs or as a spray formed by means of a blast of steam or hot air. It is also much used for production of gas, which is then burned. Owing to its cleanliness, ease of working, and to its occupying a smaller bulk than coal, it forms, wherever plentifully obtained, a very economical fuel.

Natural Gas, i.e. the gases which emanate from the soil or from bore-holes, chiefly in the petroleum districts, more especially in Pennsylvania. Within the last ten years the use of natural gas has very largely increased for purposes of heating or illumination. Thus, at Pittsburg over 250,000,000 cubic feet of gas are at present delivered daily, the bore-holes or wells numbering over 100, while the wells in some places have yielded a continuous and apparently undiminishing supply for years.

Coal Gas. Producer gases, obtained by heating coal (or other fuel) in chambers known as *producers*, have been used for many years for the heating of steel furnaces. Latterly, however, the use of ordinary coal-gas for domestic purposes, as in stoves, etc., has also been largely increasing.

Waste Furnace Gases, i.e. the gases escaping from blast furnaces, contain usually a fair percentage of the combustible carbon monoxide, CO, and are used frequently in manufacturing operations, where a high and constant temperature is not an essential.

Fuero, in Spain, a word used in the sense of a collection of laws. It was applied to the Visigothic code (*Fuero Juzgo*), when it was translated from the Latin, but it usually denoted a charter granting municipal privileges, a meaning which was afterwards extended so as to cover all forms of local self-government. Some fueros, or at least the rights confirmed by them, seem to date from the Roman period, and to have remained undisturbed during the Visigothic occupation. The earliest fuero in the form of a written charter—that granted to Leon in 1020—comprises both a *fuero general* for the province and a *fuero municipal* for the town, both embodying much earlier rights. With the progress of monarchy in Spain, and the concentration of all power in the king's hands, most of the fueros disappeared, but those of Navarre and the Basque provinces were preserved till within a recent period. A fuero always provided for some form of self-government by means of a freely-elected assembly, such as the Cortes of Navarre and the Juntas of the various Basque provinces, subordinated to a Junta General, which met under the oak of Guernica in Biscay. In the Basque provinces the administrative body consisted of a corregidor, who represented the king, and two deputies and six regidores, appointed in the Junta General. The privileges of these provinces, which in the main resembled those of other districts possessing fueros, included self-taxation, an independent system of jurisdiction, almost complete freedom of trade, and the control of their own military forces, with exemption from liability to serve in the Spanish army. The Basque fueros were suppressed in 1833, and, though restored by Isabella in 1839, were finally abolished after the Carlist rebellion in 1873-76. The word *fuero* has yet another sense, denoting the customs regulating land-tenure, inheritance, etc., which varied greatly in different localities.

Fuerteventura, one of the Canary Islands, not quite so mountainous as the others of the group. Its capital is Betancuria; it has an area of about 750 square miles.

Fugger, the name of a Swabian family that rose from humble mercantile position to princely rank. JOHN FUGGER, the founder of the house, was a master-weaver at Graben, near Augsburg, a member of the Westphalian Vehmgericht, and a fairly prosperous citizen, who died in 1409, leaving a modest fortune. His eldest son, ANDREW, was the progenitor of the noble Fuggers vom Reh, extinct for over three centuries. The second son, Jacob, remained a weaver, but accumulated a large fortune that was shared by three brothers, ULRICH, JACOB, and GEORGE. All were ennobled by Maximilian in return for timely loans, and together they built the famous almshouses known as the Fuggerei at Augsburg. George alone handed on the name and business to the next generation, and his two sons, RAIMOND and ANTONIUS, were the wealthiest men of their day and strong opponents of the Reformation. Charles V. stayed in the house of the latter at the Diet of Augsburg in 1530, and was warmed by a fire of cinnamon kindled with his own bond. Such

generous hospitality met with its reward, and the brothers were not only made princes, but received large grants of land and the privilege of issuing currency. Antonius died in 1560, leaving six millions of gold crowns as well as vast landed estates all over the world. The families of both still exist as the Fuggers of Kirchberg and Weissenhorn, enjoying the highest hereditary honours in Bavaria and Austria, and being allied by marriage with the best blood in Germany.

Fugitive Slave Laws, laws passed by the United States of America, enacting that slaves who escaped from one state, where they were legally held to "service," into another, should be given up, when claimed by their owners. The original Act of 1793 gave place in 1850 to a harsher measure, which compelled the citizens of a state to give active assistance in the reclamation of slaves, and made it a penal offence to aid their escape. The law was repealed in the course of the Civil War.

Fugue (Latin *fuga*, flight), a musical composition, in which a subject, introduced by one part, is copied successively by the other parts in accordance with certain rules. After its introduction by the first part, the subject is repeated by the second part either in the fourth or fifth, while the first part is so arranged as to agree with it, both parts being so regulated that the first cadence may be on the fifth of the key. The subject is then resumed in the same part as at the commencement, but by a different interval, and after a rest of a whole or half a bar, or even longer. The second part is brought in before the first part is concluded, the second cadence being in the third of the key. Finally the subject, being introduced by either part, is taken up sooner than at first by the other part, and the parts are then united and brought to a close by a final cadence. There are various forms of fugue—such as *fuga doppia*, "double fugue," in which two subjects begin at once in different parts; *fuga homophona*, in which the answer and imitation of the subject are in unison; *fuga irregularis*, "free fugue," in which the subject is not treated according to the strict laws of fugue-writing, etc. Vocal fugues are subject to the same rules as those written for instruments. Sebastian Bach holds the most distinguished place amongst fugue-writers. These include all the eminent composers of both old and modern times, but none of them has approached him in this branch of music.

Fujisan, a volcano in the island of Nippon, Japan, where it is regarded as sacred. It attains the height of 14,127 feet, and is conspicuous from Tokio, the capital, whence it is about 60 miles distant.

Fûlahs (properly PULO, PULLO, plural FULBE), one of the great nations of Central Africa, who have been politically dominant in West Soudan and Adamâwa since the close of the 18th century, when the Hausa states were overthrown [HAUSA], and the Fûlah empire of Sokoto founded by the Mohammedan reformer, Dan-Fodio (Othmân Dan-Fodié). The name occurs under many variants, such as *Fûla* of the Mandingans; *Fulâji*, *Fellani*,

Fellanchi of the Hansas; *Fulûta*, *Fellâta* of the Kanuri (Bornu); *Afut*, *Ifulan* of the Southern Tuaregs (Berbers), *Afellen*, *Ifellenen* of the Northern Tuaregs; *Fullân*, *Fellâta* of the Arabs; *Fûlahs*, *Fuli*, *Peul*, *Poul* of European writers, besides *Pular*, *Fulfulde*, and other erroneous forms. The original seat of this remarkable people, at least in historic times, are the two districts of Futa-Toro on the left (south) bank of the Senegal river from Falemme to the coast, and Futa-Jalon (Fuladngu) in the Upper Senegal basin. Here alone are found large, unmixed Fûlah populations; here alone the Fûlahs have preserved their racial purity; here dwell, or originally dwelt, the *Jel. Baa. So*, and *Beri*, who, according to the national genealogies, form the four great branches of the Fûlah race: lastly it was from these districts that the Fûlahs under their fanatical leader, Dan-Fodio, overran a great part of Soudan, reducing innumerable petty Moslem and pagan states, establishing their political supremacy from the Niger to Lake Chad, and founding a vast number of scattered pastoral Fûlah communities throughout the whole of West and Central Soudan as far east as Wadai and Dar-For. This great wave of political conquest, religious propagandism, and social migration has thus spread in the direction from west to east, though the race itself appears to have moved in remote prehistoric times from the east or north-east westwards to their present homes in the Senegal basin. Barth brings them from the oases south of Morocco and Twat; and, if his view be correct, they may be identified with the Leukæthiopians ("White Ethiopians") whom Pliny places south of the Mauritanian Gætulians between the Libyo-Egyptians and the Negroes north and south. Their widespread diffusion eastwards has been followed by extensive intermingling with other peoples, so that the Fûlahs of Gondo, Sokoto, Adamâwa, and other regions are not now always distinguishable from the surrounding Negro and Negroid populations. But when studied in Futa-Toro and Futa-Jalon, where they have kept aloof from the neighbouring Senegambian aborigines, the Fûlahs are at once seen not to be Negroes. De Gnirodon, who knew them well, speaks of their reddish-brown or light chestnut complexion, crisp but not woolly hair, straight and even aquiline nose, regular features, small, slim, and shapely figures, small, well-formed, and other traits which separate them entirely from the Negro, and seem to affiliate them rather with the Hamitic (Berber). But if they are originally Hamites, they have lost their Hamitic speech, the Fûlah language belonging distinctly to the agglutinating order common to nearly all the Soudanese Negroes. Some of the grammars, however, composed by Reichardt, Krause, and others profoundly ignorant of this idiom, have given rise to strange misconceptions regarding its true character. (Capt. Th. Grimal de Guirodon, *Les Puls*, 1887; R. M. Macbriar, *Grammar of the Fulah Language*, 1854; General Faidherbe, *Grammaire, etc., de la Langue Poul*, 1882.)

Fulcrum, in any form of lever (q.v.), is that point of the instrument which is held in a fixed

position. Levers are conveniently classified according to the position of the fulcrum in relation to the points of application of the force applied by the operator and of the load.

Fulda, a fortified town in the province of Hesse-Nassau, Prussia, on the right bank of the river Fulda. Here St. Boniface founded early in the 8th century, through the agency of Sturm, a great Benedictine monastery, which, like Tours in France and Iona in Scotland, became the centre of missionary work for all Germany. The prince-bishops of Fulda were in 968 recognised as primates of the Tentonic abbeys; but in the following century the power and character of the foundation declined, and has never been recovered. The cathedral now extant is the fourth that has been built on the site of the original structure, where Boniface was buried. The episcopal palace and several seminaries also testify to the past importance of the town, which is dependent for its modern prosperity on the manufacture of woollen and linen goods, earthenware, and tobacco.

Fulham, a suburb of London, on the Middlesex bank of the Thames, opposite Putney, and $5\frac{1}{2}$ miles from St. Paul's. Long before the Conquest Fulham was associated with the see of London, and in the reign of Henry VII. Bishop Fitzjames built the modest red-brick palace in which his successors still reside for a portion of the year. The gardens of 40 acres, surrounded by a moat, are scarcely inferior to those of Lambeth. The parish church of All Saints in the Decorated English style is full of interesting monuments from that of Dr. Butts, Henry VIII.'s physician, down to the tomb of Theodore Hook. Many Bishops of London are buried here. Fulham contains an orphanage, a reformatory, and manufactories of pottery and other goods. Its population is rapidly increasing, and by the Reform Bill of 1885 it is constituted a separate borough, returning one member.

Fulica. [COOT.]

Fuligula. [POCHARD.]

Fuller, ANDREW, the son of a small farmer, was born at Wicken, Cambridgeshire, in 1754. Whilst helping in the work of the farm, he began to preach to the Baptist congregation at Soham, and in 1775 was ordained as pastor there. In 1782 he was transferred to Kettering, where he had the advantage of meeting with some of the leading Nonconformist thinkers. His views now broadened, so as to lead him away from hyper-Calvinism, though he never swerved from the cardinal doctrine of salvation by grace. To advance his opinions he published *The Gospel Worthy of All Acceptation*, and after twenty years of controversy secured something like a triumph. *The Gospel Its Own Witness* is a more purely theological treatise directed against Socinianism, whilst several other volumes and pamphlets give proof of his earnest purpose and active mind. His greatest achievement was the establishment, in 1792, of the Baptist Missionary Society, over which he exercised unremitting watchfulness till his death in 1815.

Fuller, THOMAS. D.D., was born at Aldwinckle, Northamptonshire, in 1608. Possessing excellent abilities, he went to Queen's College, Cambridge, where his uncle was president, and took his M.A. degree in 1628. For a year or two he held a curacy in Cambridge, but in 1631 he received a prebend in Salisbury, and, soon afterwards, the rectory of Broadwindsor, Dorset, where he spent six years in parish work and in composing *The Holy War*, in which he deals with the Crusades, and *The Holy and Profane States*, a series of character sketches. Meanwhile his own social qualities and literary merits, with the help of family interest, had brought him into prominence as a popular London preacher and a member of Convocation. In 1640 was published his first volume of sermons, *Joseph's Parti-Coloured Coat*, and in that year he married. He was sent to Oxford with the Westminster Petition (1643), but his mission broke down. That year also witnessed the death of his wife and his own flight to the king at Oxford. He showed his devotion to the cause by joining Lord Hopton's regiment as chaplain, and he subsequently took part in the defence of Basing House, whence he proceeded to Exeter, and spent two years in that city. During this period he was assiduously collecting materials for his *Church History* and his *Worthies of England*. He now came to terms with the Parliamentarians, and returned to London, where in 1646 he brought out his *Life of Andronicus*, a veiled satire on the Roundhead leaders, and followed it up with *Good Thoughts in Worse Times*, *The Wounded Conscience*, and a translation of the *Annales of Ussher*. Lord Carlisle now gave him the curacy of Waltham Abbey, and here he settled down to his great task—the completion of the *Church History*, which appeared in 1655. Before this he had composed *A Pisgah-Sight of Palestine* (1650), and was attacked by South and Peter Heylin. The Hon. George Berkeley gave him the living of Crawford in 1658, and next year was printed his reply to Heylin under the title *The Appeal of Injured Innocence*. The proposal to institute an oath of fealty to the Commonwealth drew from him, in 1660, *An Alarm to the Counties of England and Wales*, and *Miscellaneous Contemplations in Better Times*, wherein the approaching Restoration was plainly foreshadowed. He visited Charles II. at the Hague just before that event, which he celebrated in a poem entitled *A Panegyric to His Majesty on his Happy Return*. His preferments were at once restored to him, but he did not enjoy them long, for an attack of typhus carried him off in 1661, before he had prepared the *Worthies* for the press. He was remarkably free from narrow prejudice and imbued with shrewd practical wisdom as well as with a love of goodness and truth.

Fuller's Earth is a clay or marl which generally occurs associated with chalk or oolite formations. It has a soft, unctuous feel, and has a specific gravity of 1.8 to 2.2. It is used in the cleansing of cloth—*fulling*—as it extracts the greasy materials employed in the preparation of the wool. It varies in colour from blue to yellow,

and its composition generally approximates to the following:—Silica, 60 per cent.; alumina, 10 per cent.; oxides of iron, 5 per cent.; lime, 6 per cent.; magnesia and alkaline compounds, 4 per cent.; water, 15 per cent.

Fulmar, any bird of the cosmopolitan genus *Fulmarus*, with 40 species. The Fulmars are gull-like petrels, with the characters of the family (Procellariidæ); the bill is strong and hooked, and bears the nostrils united in a single tube; the wings are long and well adapted for swift and sustained flight, for these birds rarely return to land except for nesting, or when driven there by gales; and the hind toe is replaced by a claw. The common Fulmar, or Fulmar Petrel (*F. glacialis*), has its home in the Arctic regions, sometimes straying to Britain, and it is said to nest in St. Kilda. The length of an adult male is about 16 inches, and the summer plumage of both sexes is white on the under surface and bluish-ash above. They feed on fish, molluscs, offal of any kind, and are said to pick the parasites from the skin of living whales. Fulmars are important to the natives of Northern and Arctic Europe for their feathers, down, flesh, and oil. This oil has a peculiarly strong odour, and the birds disgorge it as a means of defence.

Fulminates are metallic salts of a hypothetical fulminic acid (q.v.), or fulminate of hydrogen, and all explode violently when struck or heated. The salt most commonly used in explosives is fulminate of mercury.

Fulminating Gold. A compound of the composition $\text{Au}_2\text{O}_3(\text{NH}_3)$, the preparation and properties of which have been long known, being described by Basil Valentine in the 15th century. It is best prepared by the action of ammonia upon gold hydroxide $\text{Au}(\text{OH})_3$. It is a greenish brown powder, which explodes very violently upon percussion or heating.

Fulminating Mercury, or FULMINATE OF MERCURY, is a white crystalline solid of specific gravity 4.4, which dissolves in hot but not in cold water. It explodes violently when struck or heated, or subjected to the electric spark, the violence of the explosion being greater than that of an equal quantity of gunpowder. It is prepared by dissolving mercury in nitric acid and then adding alcohol, but its preparation is attended with considerable danger. It has the composition $\text{C}_2\text{HgN}_2\text{O}_2$, and is used in the manufacture of detonators for nitroglycerine etc., and of percussion caps.

Fulminating Silver, or FULMINATE OF SILVER ($\text{C}_2\text{Ag}_2\text{N}_2\text{O}_2$), is prepared in a similar manner to that employed for the mercury compound. It forms white, needle-like crystals possessing a bitter taste. It explodes with extreme violence at very slight disturbances, as *e.g.* rubbing with a glass rod, even under water. It is soluble in ammonia, forming an ammonium silver compound $\text{C}_2(\text{NH}_4)\text{AgN}_2\text{O}_2$, which is even more violently explosive than the silver compound itself. It should be needless to state that the preparation should never be attempted except by those perfectly conversant with

its properties, as the precautions absolutely necessary to prevent most dangerous explosions are extremely numerous and delicate. It is used in cracker bonbons. The term fulminating silver is also applied to an explosive compound of composition $\text{Ag}_2\text{O}.\text{NH}_3$, prepared similarly to fulminating gold.

Fulminic Acid. It is doubtful whether this acid, corresponding to the *fulminates*, has been really prepared. It appears to be produced by the action of sulphuric acid upon ammonium fulminate. It thus forms a crystalline solid melting at 40° , of composition $\text{C}_2\text{H}_2\text{N}_2\text{O}_2$; its constitution has been a subject of much discussion among chemists.

Fulminuric Acid, a white crystalline solid, salts of which can be obtained by boiling fulminating mercury with an alkaline chloride. The acid itself can be obtained by action of sulphuretted hydrogen upon the lead salt. It has the composition $\text{C}_3\text{H}_3\text{N}_3\text{O}_3$, but its constitution is as yet unknown.

Fulton, ROBERT, an American engineer, born in 1765 at Little Britain, Pennsylvania, began life as a portrait and landscape painter, but, visiting England in 1787 to obtain lessons from Benjamin West, became influenced by the Duke of Bridgewater and James Watt. He was one of the first to experiment in the propulsion of vessels by steam, and he built the first practicable steamer in 1807. In the meantime he had also devoted his attention to submarine boats and torpedoes. He exhibited one of the former at Brest in 1801, and subsequently in England, and some of the latter were used against British vessels in the war of 1812, but without much success. Fulton, who had returned to New York in 1806, designed, and, in 1814, began to build the first war steamer. He died in 1815.

Fumaric Acid is an "unsaturated" organic acid of composition $\text{C}_2\text{H}_2(\text{CO}_2\text{H})_2$, which is produced together with another acid of similar composition, *maleic acid*, by distilling *malic acid*. It occurs in many plants and fungi and may be prepared by a variety of synthetic reactions. It forms a white crystalline powder almost insoluble in cold water, but dissolves on warming. If heated it sublimes at 200° and yields the 'anhydride' of the isomeric acid—maleic. The isomerism of these two is remarkable, as their composition appears as expressed by ordinary formulæ to be identical, and its existence is best explained by supposing it to be due to a difference in the spatial arrangement of the atoms of the molecule, thus:—



These considerations, due to Wislicenus, have been latterly very successfully applied to other cases of otherwise unexplained isomerism, and have been fruitful in their results. [ISOMERISM, FORMULÆ.]

Fumigation, the disinfecting of rooms, etc., by means of vapours supposed to destroy infectious germs. The burning of sulphur, incense, camphor, etc., is used for this purpose, but these methods

have little, if any, real use for purposes of disinfection.

Fuming Acids. Fuming sulphuric acid, or Nordhausen sulphuric, is a concentrated sulphuric acid containing some anhydride, SO_3 , dissolved in it. It is obtained as a thick, oily, colourless or brownish liquid of specific gravity 1.88, by heating green vitriol (ferrous sulphate, $\text{FeSO}_4 + 7\text{OH}_2$). When exposed to air it evolves dense white fumes of the anhydride, which immediately forms sulphuric acid with the atmospheric moisture. *Fuming nitric acid* is a very highly corrosive liquid, consisting of concentrated nitric acid, HNO_3 , containing dissolved in it a large proportion of the lower oxides of nitrogen. It may be formed by treating nitre with fuming sulphuric acid mixed with a little starch.

Fuming Liquor of Libairus consists of tetrachloride of tin, SnCl_4 , and may be produced by distilling a mixture of corrosive sublimate with tin powder, in the proportions 5 to 1. It then forms a colourless liquid boiling at 120° , forming with a little water a soft solid, *butter of tin*. It is frequently used in dyeing operations.

Fumitory (*Fumaria*), a genus of small herbs, mostly annual, with slender climbing or straggling stems, decompound leaves and racemes of small crimson, pink, or white flowers of remarkable construction. They have two deciduous sepals; four petals, one slightly spurred and the two inner ones cohering at their apex; and stamens, apparently six in number, in two bundles (diadelphous), with one stamen with a two-chambered anther and two lateral ones with one-chambered anthers in each bundle. The fruit is an achene. These plants are common weeds of cultivated ground in Asia, Europe, North Africa, and now in the United States. The origin of its name *fumus terra*, "the smoke of the earth," is uncertain, but may be from its smoky glaucous foliage. Once valued as a medicine, it is not now used. As "rank fumitory" and "fumiter," it is twice mentioned by Shakespeare.

Funchal, the capital of Madeira, is a seaport at the head of a large bay on the south coast. From the sea, its white houses, backed by steep mountains and rich verdure, wear a most picturesque appearance. In itself the town is neither well-built nor clean, though some improvements have been made to suit the habits of English visitors. On the Loo Rock in the roadstead stands an old castle, and another, that of St. John, is situated above the town, which is protected by several coast batteries. The cathedral possesses no great interest. As a harbour Funchal is far from safe; but it does a considerable trade in wine, fruits, vegetables, and preserves. [MADEIRA.]

Functions, in *Mathematics*, are quantities whose magnitudes depend on the magnitudes of other quantities. The surface of a sphere depends on its radius; hence it is said that the surface is a function of the radius. The connection is given by a simple type of algebraic equation, $s = 4\pi r^2$; where s is the surface required, π is the ratio of circumference to diameter of any circle (q.v.), and r is the given radius. The

connection here shown between *s* and *r* being purely algebraical, the function is termed *algebraical*. Again, the cosine of an angle is a function of the angle itself; this is a simple case of *trigonometrical* functions. The logarithm (q.v.) of a number is a function of that number; this is *logarithmic*. In fact, there are functions of various types, and dependent on all kinds of variable quantities. To take one case of a complex function depending on more than one variable, the temperature of a point in a cubical block of metal, raised to a white heat and then allowed to cool in air, will be a function of the distances of the point from the faces of the cube, of the original temperature conditions of the block when first it began to cool, of the temperature of the air surrounding the block, and of the time which has elapsed since the experiment began. Numerous problems in physics introduce functions such as this, and demand very refined mathematical skill for their complete solution.

Fundy, THE BAY OF, an inlet of the Atlantic, running up 180 miles between Nova Scotia, S.E., and Maine and New Brunswick, N.W. It has a breadth of 35 miles, and, though deep, is dangerous to navigate. At its mouth lie the Grand Manan and Long Islands, with several outlying rocks, and at its head are Chignecto Bay and Mines Basin. The rivers St. John and St. Croix flow into it from the N. Tides run to the abnormal height of 70 feet.

Fünen, or FÜHNEN (Dan. *Fyen*, anc. *Fionia*), the second in size of the Danish islands, is separated from Zealand to the E. by the Great Belt, and from Jutland to the W. by the Little Belt. It has an area of 1,286 square miles, and an undulating surface rising into hills towards the W. and S.W. The soil is fertile, though the climate is very damp. Corn, flax, hemp, and fruit are grown, and dairy products, as well as cattle and meat, are exported. The coast has numerous small harbours, and many lakes exist inland. The chief river is the Odensee; the chief towns, Odensee, Svendborg, and Nyeborg, are all on the coast. The latter, being opposite Korsør, is the terminus of the railway route from Germany to Copenhagen.

Funeral Rites depend for their significance upon a belief in the continuity of life beyond the grave. The oldest funeral rite is, in all probability, that of sacrifice. Human victims, horses, and other domestic animals were slain at the burial-place that they might accompany the dead to the land of spirits, and there render him services similar to those they had performed for him on the earth. Classic literature abounds with accounts of such sacrifices, which still survive in the rite of Suttee, where the Hindoo widow throws herself on the burning pyre of her dead husband. The trooper's horse led at the funeral is a survival from the time when the horse was slain at the tomb of its master. An instance where the steed was shot and buried on the coffin occurred at Trèves in 1781; and Longfellow's *Burial of the Minnesink* made English readers acquainted with the existence of this rite among the Red Indians. Arms, implements, and domestic utensils were often buried

with the dead, and have been found time after time when barrows have been opened. Ezekiel (xxxii. 27) knew the practice as existing among surrounding nations, though it was not common among the Semites. The custom of the Greeks, who put into the hand of the dead an obolus wherewith to pay the ghostly ferryman, is kept up by the German and Irish peasantry, who deposit a coin in the coffin. It is probable that the casting of earth upon the coffin is a survival from the days of cairn-burial, when every relative and friend added his stone to the heap. The distinctly Christian rites consist of religious services, which vary somewhat in different Churches. The passing-bell is no longer believed to drive away demons lying in wait for the parting soul, and the practice of watching by the corpse has degenerated into the wake, now rapidly becoming obsolete.

Fünfkirchen ("Five Churches," Hung. *Pecs*.) is a royal free town, the capital of the Baranya circle of Hungary, and stands between the Drave and the Danube, 105 m. S.W. of Pesth. The surrounding slopes of the Mecseg mountains furnish the most productive vineyards of the country, and also possess mines of coal and iron. The bishop's palace in the Italian style, the ancient cathedral, and several of the churches are of high architectural merit, and there are also schools, colleges, and manufactories of woollen and silk fabrics. Alleged to have been founded by the Romans, the town was occupied by the Turks for 150 years, and finally taken by Austria in 1686.

Fûng (FÛNĜ), an historical Negroid people of the Upper Nile basin, whose original seat was in the Abyssinian uplands south of Senaar and along the middle course of the White Nile. In the first half of the 16th century they entered on a career of conquest, and, after overrunning the surrounding plains, founded the kingdom of Senaar, and gradually reduced all the populations along the Nile valley as far north as Wady Halfa, near the Egyptian frontier. Their empire lasted for three centuries down to the year 1821, when it was overthrown and annexed to Egypt by Ismaïl Pasha in command of an expedition despatched by Mehemet Ali. The Fûng still form the great bulk of the population, and are divided into several branches, such as the Fûng-Berûn, the Fûng-Hammêg, the Fûng-Gumuz, the Jebelavîns ("Highlanders"), the Taklavîns ("People of Takla"), the Shilluks, Bertâts, and Dinkas of the White Nile, all of whom claim kinship with this renowned race of conquerors. The Fûng language has much in common with the Beja of Lower Nubia [BEJA], and the Fûngs themselves appear to have been originally akin to the Agao and other Hamitic aborigines of the Abyssinian plateau; but, through long contact with the Soudanese blacks, they have become largely assimilated in appearance to the Negro type. The nose, however, is straight, hair crisp but not woolly, while the colour varies from a deep, yellowish brown to a deep, bluish black, with very shiny skin, like that of the Nubians. (James Bruce, *Travels*; Trémaux, *Le*



1. Chantarelle (*Cantharellus cibarius*).
2. Milk Agaric (*Lactarius deliciosus*): a, fully-grown; b, immature.

3. Truffle (*Tuber cibarium*).
4. Mushroom (*Agaricus campestris*): a, fully-grown; b, immature.
5. Honey Mushroom (*Agaricus melleus*).
6. Yellow Clavaria (*Clavaria flava*).
7. Morel (*Morchella conica*).
8. Scaly Mushroom (*Agaricus procerus*).
9. Edible Bolete (*Boletus edulis*).
10. Spine-bearing Mushroom (*Hydnum repandum*).

Soudan; Hartmann, *Skizze der Landschaft Sennâr*, in *Zeitschrift für Allgemeine Erdkunde*, vol. xiv.)

Fungi, one of the two main divisions or classes of cellular Cryptogamia (q.v.) or Thallophyta (q.v.), distinguished by the absence of chlorophyll (q.v.). The physiological consequences of this absence include the absence of starch and the possession by every member of the class of a mode of life either parasitic or saprophytic. As parasites they may attack either other plants of any grade, or animals. One important group, the lichens (q.v.), live in a state of symbiosis (q.v.) with some of the lower algæ (q.v.). Other fungi live as *entophytes* within the tissues of other living plants. The varied members of the order Schizomycetes, often known generally as Bacteria (q.v.), play an important part in many fermentations and putrefactions and in the ætiology of disease. They are the simplest and most minute members of the class, being single cells, sometimes not more than $\frac{1}{2500}$ of an inch in diameter. This order is now by some botanists separated from the Fungi into a class by itself, as are also the Myxomycetes (q.v.), which are not made up of cells at all. All other fungi are made up of *hyphæ*, elongated cells or chains of cells, occurring either singly, adhering in parallel lines, or densely interwoven. In some cases pressure gives these hyphæ a polyhedral "pseudo-parenchymatous" structure. [PARENCHYMA.] The cell-walls of fungi consist of a modified form of cellulose known as *fungal cellulose*, which does not turn blue with iodine. They are generally unthickened. In many fungal cells no nucleus has as yet been detected; but, though no chlorophyll occurs, metallic greens, reds, violets, and various other colouring matters often occur in the group. Many fungi are undoubtedly poisonous, containing *muscarine* and other poisonous principles, some of which seem to be volatile or to be destroyed by heat. Many other kinds are not only edible but valuable articles of food, though but very few species, such as mushrooms, champignons, chanterelles, and truffles, are commonly eaten.

Reproduction is effected among fungi both by sexual and by asexual means, of which there are many variations. The most common non-sexual method is by the formation of special cells or *spores*, either by "acrogenous abjunction"—i.e. separation from the extremities of hyphal cells, or endogenously by "free-cell formation" in *sporangia*, such as *asci*, the spores formed being sometimes ciliated *zoospores*, though less commonly so than among Algæ. The modes of sexual reproduction also vary considerably in the different families. In several groups there is a marked alternation of generations (q.v.). It is usually possible—at least in the higher groups—to distinguish between a vegetative part of the thallus known as the *mycelium* and a reproductive part known as the *receptacle*. The mycelium is generally a loose mass of filamentous hyphæ, sometimes branching or anastomosing. In parasitic forms its hyphæ may have short branches or *haustoria* penetrating the cells of the host. In other cases the mycelium forms thick strands formerly known as *Rhizomorpha*, or still more

dense tuber-like masses serving as a resting store of reserve material and called *sclerotia*. Some of these dense mycelia, termed *mycorhiza*, are associated with the roots of various trees, which do not then develop root-hairs, and the association is believed to be a form of symbiosis or commensalism (q.v.).

The receptacle generally rises erect from the mycelium, and may consist either of single hyphæ bearing terminal spores, or of relatively large "compound" bodies, composed of many hyphæ bearing sporiferous surfaces or *hymenia*. The stalk and umbrella-like cap (*pileus*) of the mushroom and the ball-shaped *peridium* of the puff-balls are such compound receptacles. If the hymenium is external, the receptacle is *gymnocarpous*; if internal, *angiocarpous*.

The main divisions of the class may be arranged as follows:—

- Sub-class i. *Myromycetes*.
- „ ii. *Schizomycetes* (Bacteria).
- „ iii. *Phycomycetes*.
- Division 1.—Zygomycetes, including the orders Mucorini (the moulds), and Ustilagineæ (the smuts).
- „ 2.—Oomycetes, including the orders Peronosporæ, such as the potato-fungus, and Saprolegniæ, such as the salmon-disease.
- „ iv. *Ascomycetes*, including the orders Pyrenomycetes, such as ergot, and Discomycetes, such as *Peziza*.
- „ v. *Æcidiumycetes*, such as wheat-rust (*Puccinia* or *Uredo*).
- „ vi. *Basidiomycetes*, including the orders Hymenomycetes, such as mushrooms, and Gasteromycetes, such as puff-balls.

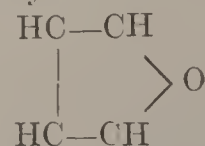
Most of these groups are separately described. The Lichens (q.v.) are forms belonging mostly to the Pyrenomycetes and Discomycetes, but also in some cases to the Hymenomycetes or to the Gasteromycetes, which are associated symbiotically with some of the lower Algæ, thus forming compound organisms.

Fungidæ, a family of corals including all those in which the septa are united by the small cross bars known as synapticulæ. The typical genus, *Fungia*, has a form somewhat like the top of a mushroom,

Fung-Whang, the Chinese phoenix, described as adorned with every colour, and combining in its forms and motions whatever is elegant and graceful. Its disposition is so benevolent that it will not peck or injure living insects, or tread on growing herbs. It has not been seen since the days of Confucius. (Williams, *Middle Kingdom*.)

Fûnj. [FUNG.]

Furfuran, a compound of composition C_4H_4O , which may be obtained by various synthetical reactions, and occurs in the products of distillation of pine wood. It is a liquid boiling at $32^\circ C$. Its constitution appears to be that of a closed chain, as represented by



and it is interesting as forming one of the compounds which may be regarded as intermediate

in character between the fatty and aromatic series. It yields numerous derivatives, the fur-furan compounds, some of which form valuable dyestuffs.

Furlong (A.S. *furlang*, the length of a *furh* or furrow), a measure of length, 220 yards or one-eighth of a mile. The furlong was originally a square measure also; according to Kemble, 200 yards in length and 5 yards in breadth in Saxon times, answering to the *quarentena*, rood, or "small acre."

Furnace, a structure designed to contain burning fuel, and to utilise the heat of combustion to the best possible advantage. For many years the most important furnaces have been those required for steam boilers; and, as the functions of these are various, there have been many kinds of steam furnaces. It must be understood that the design and construction of furnaces with a view to the greatest economy of heat of combustion must be carried out so that complete combustion may be insured before the hot gases pass away from the boiler; a sufficient supply of oxygen must be given to the combustible substances; this supply must be properly mixed with the various heated gases that come off, and the amount of heating surface must be as great as possible. These points apply to some extent to the general design of boilers (q.v.), and need not be discussed here; but, so far as combustion is concerned, it may be stated that the furnace is generally improved by the addition of a combustion chamber for the proper mixing of the combustible gases and the oxygen, though it is not necessary that complete burning should take place therein. Greater efficiency is obtained with forced draught than with natural chimney draught, whose efficiency is frequently 25 per cent. less. In the case of the ordinary Cornish or single-flue boiler, the furnace forms a portion of the front end of the flue, being separated from the rest by a *bridge* of fire-brick or hollow metal. Similarly in two-flue or multitubular boilers the furnace occupies a portion of the front end of the boiler, and from it pass the various flues. Marine boilers are generally more compact, and economy of fuel, though a matter of great importance, is subservient to economy of space; and whereas land boilers will burn 14 lbs. of coal per square foot of grate per hour, the marine furnaces frequently rise to 24 lbs. But locomotives, with their forced draught and much less heat efficiency, sometimes burn as much as 200 lbs. per square foot per hour. In furnaces employed for smelting, etc., the part of the furnace upon which the *charge* of ore, flux, etc., is placed, and upon which the metal collects until it is drawn off, is known as the *bed* of the furnace, and is generally constructed of very refractory fireclay. *Reverberatory* furnaces are a form with low, arching roofs, from which the flames and products of combustion are reflected on to the surface of the ores, etc. *Cupellation* furnaces are, as their name indicates, employed for cupellation (q.v.); a small form heated by gas is of service and much employed for laboratory and assaying purposes. Small gas *muffle* furnaces are also useful for heating

crucibles, etc. In most furnaces the draught is created by the heated gases themselves; but in many, where high temperatures are required, the draught is increased and combustion quickened by blasts of hot air or steam. Large blast furnaces are employed for the smelting of iron ores. [BLAST FURNACE, IRON, SMELTING.] Furnaces in which the highest obtainable temperatures are required, as those for the working of platinum, are constructed of blocks of lime, and heated by the oxy-hydrogen blowpipe.

Furness, a manorial liberty comprising the promontory between the mouth of the Duddon and Morecambe Bay, in N.W. Lancashire. It was granted by King Stephen to the monks of Furness Abbey, the ruins of which, dating from 1128, still exist close to Dalton station. The district, though agriculturally poor, has great mineral resources, which have been very successfully developed by the present proprietors, the Dukes of Devonshire and Buccleuch. [BARROW-IN-FURNESS.]

Furnivall, FREDERICK JAMES, M.A., PH.D., was born at Egham, Surrey, in 1825, and educated at University College, London, and Trinity Hall, Cambridge. A barrister by profession, he has devoted his life to English philology and literature, which he has cultivated, not merely by the aid of various special societies, but by a considerable amount of laborious individual research. Dr. Furnivall's chief works are *L'Histoire del Saint-Graal*, with its English reproductions, *A Six-Text Print of Chaucer's Canterbury Tales*, *Carton's Book of Curtesye*, *Robert of Brunne's Chronycle*, and *The Bibliography of Robert Browning*. For several years he acted as editor of the Philological Society's new *English Dictionary*. In 1885 he received a Civil List pension, and of late years he has been engaged in somewhat controversial discussions on Shelley. He was in his earlier days a great authority on rowing and boat-building.

Furs, the name given to the skins of animals, which have a double coating of hair, that next the skin being short and downy, while the outer coating consists of longer and coarser hairs, intermingled with the former. Fur increases in thickness, and consequently in value, during the winter, and it tends to become thinner as animals grow older. The increased demand for furs in recent times has given a great stimulus to the trade, which is even more prosperous now than it was in the early days of North American colonisation. It seems possible that, unless precautions be taken, the larger kinds of fur-bearing animals, such as the bear and the beaver, may become extinct, or at least extremely rare. Some of the smaller species, on the contrary, thrive better, and increase more rapidly in the neighbourhood of man than they do in a wilder state. Many of the most important fur-bearing animals are natives of Siberia and the northern districts of North America—the expeditions in pursuit of them being undertaken in the spring, when the fur is in the best condition. The smaller kinds abound in the United States, and martens, foxes, hares, and rabbits are common in Europe. Rabbit

skins are also obtained from Australia as well as those of kangaroos and opossums, while Africa furnishes monkey and leopard skins, and South America chinchillas and nutrias. Skins are seldom dressed before exportation. The first step in the process is to immerse them for some time in liquor; the superfluous fat is then removed by means of a sharp knife, and allowed to dry off; they are next placed in tubs containing butter and warm sawdust, and trodden under foot till the pelt becomes supple, after which dry sawdust is used before they are beaten out. The principal fur-trading companies at the present time are the Hudson Bay Company, established in 1680, and the Alaska Commercial Company, established in 1870. Public auctions for the sale of their furs, including private collections consigned to their care, are held in London in January and March. Continental and Asiatic furs are sold at annual fairs at Leipzig, Nijni-Novgorod, Irbit, and other centres.

It is impossible to give a minute description of all the various kinds of fur, but the following demand particular notice. Among *bear* skins that of the brown bear is the most valuable, but the coat of the ordinary black bear, which has a long, thick, glossy fur, sometimes fetches £14. They are obtained chiefly from Canada and Alaska. Other varieties are the White Polar, the Russian, and the grizzly bear, which inhabits North America. The under fur of the *beaver* (as well as those of the nutria, rabbit, and other animals) is used for felted materials, after it has been separated from the pelt and the long upper hairs have been removed. It is usually of a rich brown hue, but the best furs are perfectly black. About 150,000 are imported annually from North America. The "real" *chinchilla* fur, as distinct from the "bastard" variety, is much prized for its softness and delicacy. It is bluish grey in colour. The most valuable are imported from Peru. The *ermine* abounds in all northern regions, but is known under that name only in its winter coat of white with a black tip to the tail; in its summer coat it is called stoat. Ermine furs are far more valuable than stoat furs. Only those found in very cold climates, especially in Siberia, form an article of commerce. *Miniver* consists of ermine with lambskin intermixed in black spots with the material. The most important *fox* furs are those of the red, cross, and silver foxes, which are all natives of North America, and sometimes form part of the same litter. The ordinary colour of the red fox is sandy red, but it varies from a very pale tint in Minnesota to a brilliant red colour in Kamschatka; the Asiatic variety is often called the "fiery" fox. Those found in Europe are of an inferior quality. This fur is much worn by the Turks, Chinese, and other Eastern nations. The silver fox, found chiefly in Alaska and the Hudson Bay Territory, is scarcer than the red; its colour is silvery grey or black and occasionally perfectly black, in which case the price sometimes reaches £55. The most valuable kind of *lamb* skin is the Persian, about 200,000 of which are imported annually from Persia. The fur is originally black, but the same colour is used in dyeing it, so as to conceal the white leather below.

The fur of the *marten* has long been esteemed for its softness, lightness, durability, and comparative cheapness; the average price at present is about 25s. It is obtained in large quantities in North America, especially in Labrador, Maine, and the neighbouring districts. The ordinary colour is a rich brown. From the bushy tails muffs and similar articles are manufactured. *Nutria* fur is obtained from the coypu rat, a native of South America. The *sea otter*, found on the Aleutian Islands and elsewhere in the Sea of Kamschatka, has much decreased of late years in consequence of the recklessness of traders. The price of a skin usually ranges from £20 to £70, but as much as £155 has been obtained. The hair is rich, soft, and glossy. This skin is much worn in Russia. The *otter* inhabits most parts of the world, but the skins sold come chiefly from North America, especially Nova Scotia and Labrador. The fur is remarkably thick and close, varying in colour from light to very dark brown. The outer coating of hair is sometimes retained. The price ranges from 9s. to about £5. The *rabbit* is the commonest of all fur-bearing animals. An enormous number of skins—said to amount to over 10,000,000 annually—is exported from Australia. They are used in a great variety of forms, and "coney wool," the name given to the fur when it has been removed from the pelt, is employed for felting purposes. *Fur seals* formerly abounded in the south seas, but the supply is now drawn from the North Pacific and Behring Sea. The number of Alaska seals caught annually is limited by the United States Government to 100,000. They are for the most part prepared in London. The first step is the "blubbering" or removal of the superabundant fat; this is followed by washing, unhairing, leathering, and dyeing, after which the pelt is shaved, and the "water" hairs are completely removed by machining.

Fûrs (FORS), a large Soudanese nation formerly dominant in the region between Kordofan and Wadai, which from them takes the name of Dar Fûr ("Land of the Fûrs"). They occupy all the Marrah or central uplands (Dar-Dima and Dar-Uma), the chief divisions being the *Dudunga Kunjara* and the royal tribe, *Kera*, whose last king, Barâhâm, was conquered and slain by the notorious Zebehr Pasha in 1873. The Massabâts, another branch, detached some centuries ago from the main stock, are widely dispersed throughout Dar-Fûr and Kordofan, mostly intermingled with the Soudanese Arabs, whose language they now speak. The Furang-bélé, or Fûr language proper, has been shown to be related to the Nuba of Kordofan, and there can be no doubt that the Fûrs, Nubas, and Nubians of the Middle Nile are all members of the same Negro race which at one time was dominant throughout the whole of East (Egyptian) Soudan. The Fûrs of the Marrah mountains are certainly pure negroes, and the women especially are described as of an extremely repulsive type. All are distinguished by their almost black complexion, low, retreating brow, broad, flat features, pronounced prognathism, and short, woolly hair. The moral qualities also are

of a low order, and Nachtigal speaks of them as vainglorious, insolent, lazy, treacherous, and unfriendly to strangers. (Nachtigal, *Dar-För, die neue, ägyptische Provinz*, in Petermann, 1875; Dr. Pfund, *Reisebriefe aus Kordofan und Dar-Fur*, 1875-76.)

Fürst, JULIUS, was born of Jewish parents at Zerkowo, Posen, in 1805. Destined for the rabbinical career, he acquired a sound knowledge of Hebrew, and went to the University of Berlin. Poverty compelled him to interrupt his studies until 1827, when he broke loose from Jewish orthodoxy and betook himself first to Breslau and then to Halle. At the latter place he enjoyed the teaching of Gesenius, Wegschneider, and Tholuck. In 1839, having begun the publication of his *Lehrgebäude der Aramäischen Idiome*, he obtained a professorship at Leipsic, where he remained until his death in 1873. Among the many erudite works which he produced may be mentioned a *Hebrew and Chaldee Dictionary, Concordantia*, an edition of Buxtorf's great compilation, *Histories of the Karaites*, and of Biblical literature, and *Bibliotheca Judaica*. He also edited *Der Orient*, a Jewish periodical.

Fürth, a town in the circle of Middle Franconia, Bavaria, at the confluence of the rivers Pegnitz and Regnitz, and 5 miles by rail from Nürnberg. Here Gustavus Adolphus, in 1632, made an unsuccessful attack on Wallenstein, and two years later the place was destroyed by the Croats. The population consists largely of Jews, who are engaged in the making of glass, mirrors, turnery, surgical instruments, lacquer, pencils, etc. A large annual fair is held at Michaelmas. It was ceded to Bavaria in 1806, and its commercial prosperity dates back about 150 years.

Furze, GORSE, or WHIN, the popular names of the small genus *Ulex*, belonging to the order Leguminosæ. They are much-branched, very spinous plants, with axillary, sweet-scented, yellow flowers, which have a bilabiate calyx, and with swollen, few-seeded pods, which burst elastically when ripe. They occur on heaths on a clay or sandy soil, or even on shingle, from Denmark to Italy, and the larger species, *U. europæus*, often forms a characteristic feature in English landscape. A double-flowered form is grown in gardens. The tough woody stem is used for making walking-sticks; and the shoots, if the plant is cut down, when bruised, form a fodder of which cattle are fond. The plant contains a powerfully purgative alkaloid, known as *ulcerine*.

Fusano, LAKE, a small crateric lake in Southern Italy, 16 miles west of Naples, and included in the peninsula of Baiæ. It was celebrated for oysters among the Romans, and its picturesque shores served as a favourite burial-place. Hence it was sometimes spoken of as *Acheron* and *Acherusia Palus*.

Fuse, in artillery, a device to regulate the moment of bursting of a shell or explosive charge. Fuses are either "time" or "percussion," or combinations of the two. Time fuses are tubes filled

with a composition which burns at a known speed. They are inserted into the explosive charge, and fired either by hand or, in the case of a shell, by the flash caused by the discharge of the gun. These fuses are generally marked externally, so that they can be set to burn for any desired number of seconds, or fractions of a second. Percussion fuses are fired by the concussion of the impact of the projectiles to which they are fitted, and they can be made to explode the charge either directly or by delayed action. Detonation may also be made to ignite the supply of explosive, in the case of shells. An electric fuse may be used and worked from a distant position if the explosive mass is stationary. A current of electricity is sent through a fine wire which is in contact with the charge, along wires leading from the operator. He can time the current at will, and, if sufficiently strong, it will bring the thin wire to white-heat and produce instant explosion.

Fuseli, or FÜSSLI, HENRY, the son of an artist of note, was born at Zürich in 1741, and brought up for the Church. He took orders, but, having joined with his gifted schoolfellow, Lavater, in exposing a magistrate, had to seek voluntary exile. He reached England in 1763, made the acquaintance of Sir Joshua Reynolds, and by his advice devoted himself to art. In 1770 he went to Italy, where he spent eight years, and Italianised his name. On his return to England he found a patron in Boydell, the organiser of the Shakespeare gallery, brought out a translation of Lavater's *Physiognomy*, assisted Cowper with his *Homer*, and exhibited a series of paintings illustrative of Milton's poems. In 1790 he was elected R.A., and in 1799 was appointed Professor in Painting in the Academy, to which office he afterwards added the keepership. His lectures were published after his death, but they are not of much value, for his slap-dash method could hardly be inculcated by words. He had considerable ingenuity and power, being able to inspire his figures with a suggestion of movement; but he cared little for nature, and derived his ideas chiefly from a morbid imagination. So it came to be a legend that he supped on underdone pork chops in order to court hideous dreams. Of his 200 pictures the most famous, undoubtedly, is *The Nightmare* (1781). His keen sense of humour is shown in his illustrations of the *Midsummer Night's Dream*. He died at Putney, in 1825.

Fusel Oil, known also by the name of potato oil, grain oil, etc., is obtained in small quantities during the alcoholic fermentation of saccharine substances. It consists chiefly of a mixture of different alcohols, but contains also a small proportion of various acids and ethers. The relative proportions of these different substances vary with the nature of the saccharine material employed, with the ferment used, and with the physical conditions of the fermentation. The compounds present in greatest proportions, however, are usually two alcohols known as *amyl alcohols*, $C_5H_{12}O$. One of these is further distinguished as *inactive* amyl alcohol, as it has no action on polarised light. This compound is a liquid boiling at $131.5^{\circ} C$.

specific gravity .8104, and possessing the constitution $(\text{CH}_3)_2\text{CH}.\text{CH}_2\text{CH}_2\text{OH}$. The second, or *active* amyl alcohol, boils at 127° , is laevorotatory [POLARISATION], and has the constitution $\text{CH}_3(\text{C}_2\text{H}_5):\text{CH}.\text{CH}_2\text{OH}$. Fusel oil is soluble in ether, alcohol, and other organic solvents. It is used for the manufacture of *amyl* compounds, and as a solvent for the alkaloids. Its estimation in alcoholic liquors is frequently of importance, and many special methods are employed, but in all cases the determination is one of considerable difficulty.

Fusible Metal is an alloy of 8 parts bismuth, 4 parts tin, and 4 parts lead. It melts at 94°C ., i.e. a temperature lower than the boiling-point of water. By the addition of a little cadmium a product (Wood's alloy) is obtained which melts at a still lower temperature—about 63°C .

Fusion means the change of state of a substance from solid to liquid. It is the reversed half-cycle of changes that take place when a liquid freezes. [LIQUEFACTION.]

Fustian, a twilled cotton fabric, closely resembling velvet. It has a short nap, produced by cutting the loops formed on the surface by the weft threads, and afterwards brushing and singeing them. Velveteen and corduroy are varieties of fustian. It is said to take its name from El-Fustat, a suburb of Cairo.

Fustic. Two dyes are known by the name of fustic:—(1) *Young Fustic* and (2) *Old Fustic*. The former of these yields but fugitive colours, and at the present time is not much used. The latter is, however, largely used in woollen and silk dyeing. With a "tin or stannous mordant" it gives a bright yellow, while by use of bichromate of potash, copper sulphate, etc., old gold, olive, and other shades may be obtained. It does not find much application, however, in the dyeing of cotton fabrics. Old Fustic is the yellow wood of *Maclura tinctoria*, a large tree belonging to the Mulberry family, native to the West Indies and tropical America. Great Britain imports less than a thousand tons annually, either as chips, ground, or as extract. The smaller but equally yellow-wooded branches of the entirely distinct *Rhus Cotinus* of South Europe, which is known as the Zante or Venetian sumach, or, from the feathery branches of its inflorescence, as the wig-tree, are similarly employed under the name Young Fustic, being once supposed to be twigs of *Maclura*.

Fusulina, an extinct genus of Foraminifera (q.v.), very abundant in the Carboniferous period; vast sheets of limestone of this age are formed largely of its shells.

Fyzabad, or FAIZABAD, a division, district, and city of Oudh, British India, under the government of the North-West Provinces. The former comprises the districts of Fyzabad, Gonda, and Bharaich, and has an area of 7,671 square miles. The district of Fyzabad, lying between the Gogra and Gumti rivers, has an area of 1,649 square miles, and contains the ancient city of Ajodhya. It is

traversed by the Oudh and Rohilkund Railway, and has a growing trade and population. The largest towns are Fyzabad, Tanda, Ajodhya, Jitalpur, and Sajauli. Rice, wheat, oilseeds, sugar, cotton, opium, indigo, and tobacco are the chief products. The chief town, Fyzabad, stands on the southern bank of the Gogra, close to Ajodhya, of which it is historically a suburb. It was founded about 1730 by the Nawab-Vizier Saadat Ali Khan. When Lucknow became the capital of the state (1775) it declined, but its prosperity has since increased. At the time of the Mutiny the garrison of Fyzabad let the Europeans escape, but most of them were massacred before reaching Dinapur. The city contains some handsome tombs, and gardens noted for fruit.

G.

G. The letter G is of Italic origin, and was produced by a differentiation of C, to denote the original sound of that letter, as distinct from its other value of *k*. Of the two sounds of *g*, the hard and the soft, the former is the original one, which belonged to it in Latin, and persists, even before *e* and *i* (cf. *get*, *give*) in words of Anglo-Saxon origin, excepting before *e* final (cf. *cringe*). The name "guttural mute" is incorrect, since the throat plays no part in the formation of the sound. It was introduced into Latin about the sixth century A.D., and in English is chiefly confined to words of Romance origin.

Gabbro, a name originally applied to an Italian serpentine containing that variety of augite known as diallage; but now used for a family of plutonic rocks of basic composition and granitoid texture, consisting of anorthite or some allied basic feldspar with some ferro-magnesian silicate, such as diallage, augite, or less typically hornblende or olivine. Though essentially holocrystalline, these rocks may be coarse or fine-grained: they have a specific gravity between 2.9 and 3.0; and contain from 48 to 54.6 per cent. of silica, from 10 to 29 per cent. of alumina, from 4.8 to 15.8 of iron-oxides, and from 9 to 18 per cent. of lime and magnesia. They occur in the Lizard district, Anglesey, Mull, Skye, Sutherland, Carlingford, etc., forming intrusive bosses.

Gabelentz, HANS CONON VON DER (1807–1874), a German linguist and ethnologist, was born at Altenburg, where too he was educated under the celebrated Greek scholar, Matthiæ, and gave his attention especially to Arabic and Chinese. He then proceeded to Leipzig and Göttingen. In 1830 he entered the public service of the Duchy of Altenburg, and in 1848 was member of the Frankfort Parliament, becoming in the same year President of the Altenburg Ministry. From 1851–68 he was President of the Second Chamber, retiring in the latter year to devote himself entirely to study. It was in 1832 that he published his *Elements of Manchourian Grammar*, and in 1843–46 he joined

with an old school-fellow in the translation of Ulfilas's Gothic Bible. He made researches into and wrote upon many Eastern tongues, from Suaheli to Formosan, and in 1860 he wrote a treatise upon the *Passive in Universal Grammar*. His great work (1873) was a treatise upon the Melanesian and Malay group of languages.

Gabelsberger, FRANZ (1789-1849), born at Munich, was the inventor of a system of shorthand much used in Germany and German-speaking countries. He was a secretary in the Bavarian Civil Service, and invented his system for his own private use, and then used it in Parliamentary reporting. His method was to use, as far as possible, symbols closely approaching German forms of letters. He published an account and description of his system.

Gabion, in fortification, a basket of twigs or osiers, in the form of a cylinder, from 2 feet 9 inches to 6 feet high, and about 2 feet in diameter. They are filled with earth and placed in rows as a protection against the enemy's fire.

Gable, the upper part of the wall at the end of a building, which is triangular in form, owing to the slope of the roof. The Gothic gable corresponds to the Classical pediment (q.v.). Gables vary much in their pitch and in the treatment of the outline. In Norman churches the only ornament used was a cross at the apex, but in succeeding styles, the coping, previously flat and plain, is often richly moulded. In the Perpendicular style, however, the sides of gables sometimes consist of a series of steps.

Gaboon River, the Portuguese name of an estuary and settlement on the E. coast of Africa. It has different native names, and is situate just N. of the equator, in lat. 21° 25' N., and long. 9° 21' W. At the entry it is 18 miles wide, and at 40 miles distant it has a breadth of 2 or 3 miles, and takes the name of Rio Olambo, being formed by the tributaries Mkomo and Mbokwa. The former of these is the longer, and has been explored for a considerable distance. Captain Burton explored the second to a point where it narrowed to a width of 50 yards. The south bank of the estuary is low and marshy, and on the north bank, which is higher, is the French settlement of Libreville, which, since the Franco-German war, had, till lately, become merely a coaling-station; but the recent expeditions of De Brazza have re-aroused the attention of the French nation to this region. There are also several English trading-ports, and most part of the commerce has been carried on by the British. The Remboa and the Eko are also tributaries, and there are islands, reefs, and shoals, the chief islands being King's Isle, at the mouth of the Eko, and Parrot Island, in mid channel. It was in 1839 that France first gained a footing in the region, and they gave the name of *Gabons* to the Mpongwa, whom they found to be the principal race there. Other races are the Fans, the Bakalai, and the Boulous. Burton found the Mpongwa to be far advanced in civilisation, and their women to occupy a good position, while their language is the

lingua franca of the colony. The Fans, who also were civilised, but to a smaller degree than the Mpongwa, and who were addicted to cannibalism—only as a religious ceremony, however—have been lately moving forward, and may become the predominant native race. The district exports ivory, bees-wax, caoutchouc, ebony, and camwood, and was once the seat of an active slave-trade.

Gaboriau, EMILE (1835-1873), an eminent French novelist, was born at Saujon. In his early literary career he wrote for the Parisian papers, and his first great success was *L'Affaire Lerouge*, which appeared as a *feuilleton* of *Le Pays*. His tales are of the police and detective type, and display great ingenuity of plot. Two of his works, *L'Argent des Autres*, and *La Degringolade*, were published posthumously.

Gabriel (Hebrew, *man of God*) is generally represented as one of the four archangels, and is especially considered as the messenger of God—*e.g.* to Daniel and to the Virgin Mary. The later Jewish tradition considered him to preside over the forces and processes of nature, and looked on him as the destroyer of the host of Sennacherib.

Gad. 1. The son of Jacob and Leah, and founder of the tribe bearing his name, who were shepherds and also great warriors.

2. A prophet or seer—probably a pupil of Samuel—friend of David, whom he joined in the evil days of his fortune, and whose prosperity he also shared, receiving at Court the name of "the king's seer." He organised the musical services and wrote a chronicle of David.

Gadames, the chief town of an oasis in the Sahara, in the government of Tripoli, and near Algeria. The oasis is surrounded by an old wall of 10 to 12 feet in height, and the streets of the town are crooked and narrow, and in many cases covered on account of the heat. There are several mosques and schools, and education is general. The oasis is a great meeting centre for caravans, and the inhabitants are good traders and merchants, and have many establishments in North and Central Africa. They are mostly Berber in race, though in the S. there is some negro admixture. There are warm springs in the oasis, and there are remains of Roman architecture.

Gaddi, the name of an Italian family of painters, the chief being—

1. GADDO (1239-*circa* 1312), who painted and did mosaic work, that in the portico of the basilica of Santa Maria Maggiore in Rome being his, and possibly the great mosaic in the portico of the cathedral at Florence. He also executed a mosaic for the *old* church of St. Peter's at Rome. None of his paintings are known to exist.

2. TADDEO (first half of 14th century), son of the above, was a painter, mosaic-worker, and architect, and was the pupil of Giotto. He did frescoes for the church of Santa Croce, Florence, and there are two altar-pieces, a triptych, and other paintings of his.

3. AGNOLO, son of Taddeo (latter half of 14th

century), was a painter and also a successful merchant. He painted the *Raising of Lazarus* and eight frescoes in Santa Croce representing the *Legend of the Cross*.

Gade, NIELS WILLEM, a Danish composer, was born (1815) at Copenhagen. In 1841 he published *Echoes of Ossian*. He studied at Leipzig, and succeeded Mendelssohn as leader of concerts. In 1868 he became master of the Chapel Royal at Copenhagen. He published eight symphonies, *Comala*, the *Erl King's Daughter*, and other vocal and instrumental pieces. He died in 1891.

Gad Flies, a family known as the *Tabanidæ*, belonging to the order Diptera or true flies; the females of this family are parasites, and live on the blood of various mammals; to obtain this they pierce the skin of the animal with a tubular proboscis and then suck the blood. The bite is painful, but more serious damage than this local irritation is caused by the spread of diseases which result from their attacks; thus the cattle disease known as anthrax is believed to be largely spread by the distribution of the bacillus (*Bacillus anthracis*) by gad flies. The largest English species is *Tabanus bovinus*.

Gadidæ (Cod-fishes), a family of Anacanthinous fishes, with twenty-one genera from Arctic and temperate seas. The body is elongated, and covered with small smooth scales; dorsal fin generally divided; ventral fins on the under side of the throat. They are very important food fishes. [BURBOT, COD, HADDOCK, HAKE, LING, WHITING.]

Gadolinite, a rare mineral, which was discovered by Gadolin, in 1788, at Ytterby in Sweden. It forms monoclinic crystals, and is interesting as the source of many of the rarer chemical elements, viz.:—*Yttrium*, which it contains to the extent of 35 per cent., *Ytterbium*, *Scandium*, frequently, also, *Erbium*, *Cerium*, *Didymium*, and *Lanthanum*; while sometimes *Beryllium* is found among its constituents.

Gadsden, (1) CHRISTOPHER (1724–1805), was born at Charleston in South Carolina, United States, and, after being educated in England, became a merchant in Philadelphia. He was a member (1774) of the first Congress, and during the war became brigadier-general and lieutenant-governor of South Carolina, and was for a time prisoner in the hands of the British. (2) JAMES, grandson of the above (1788–1858), was born at Charleston, and served in the war against the British in 1812 and against the Indians. His name was given to a portion of territory which, under a treaty negotiated by him, the Government bought in what are now Arizona and New Mexico.

Gaduns (JADUNS), an Afghân tribe, occupying the southern slopes of the Mahabân mountains and parts of the Hazâra district within the British frontier of Peshâwar. Though long settled amongst the Jusafzaes, they are said to have been originally a branch of the Kakars. Two main divisions: *Salâr*, with three septs—Matkhwa, Uta, Sulimân;

Mansîr, also three septs—Khadr, Daolat, Mûsa. Total population (estimated), 12,000.

Gadwall (*Anas strepera*), a wild duck resembling the mallard, but of smaller size. It is widely distributed in Europe, Asia, and America, but is a very rare British visitor. Large flocks, however, are protected on many Norfolk estates, notably at Merton.

Gæa, or GAIA, the Greek goddess of the earth, was, according to one myth, the first-born of Chaos, and mother of Uranus and Pontus, and of the Titans, the Cyclopes, and others. Her story represents a theory of the creation. At Rome she was worshipped as Tellus, and black ewe lambs were sacrificed to her.

Gaeta (anciently GAIETA) a coast town of S. Italy, in the province of Caserta, 50 miles N. of Naples, is situated on a promontory jutting into the Mediterranean, and is strongly fortified, and has been called the Gibraltar of Italy. Its bay, which has been spoken of by Virgil, almost rivals the far-famed Bay of Naples. The town has been often besieged, and became the refuge of Pius IX. in 1848–49, and that of Francis II. of Naples in 1860–61. There are many Roman remains, among them being a round tower, known as Torre d'Orlando, which is thought to be the tomb of Plancus, of consular renown. The Constable of Bourbon, killed in the siege of Rome, is buried in the citadel. There is a cathedral—in which is the body of St. Elmo, and which has a former altar of Bacchus as a font—and many churches and convents. There is considerable fishing, and a coasting-trade in corn, wine, oil, and fruits.

Gætulia, an ancient country of North Africa, of uncertain extent, but stretching probably from Mauretania and Numidia, to the basin of the Niger, and bounded on the W. by the Atlantic Ocean. The inhabitants of the region were considered by Sallust to be one of the aboriginal races, and it is possible that they were what are now Berbers, while the Melano-Gætuli of the south showed the admixture of negro blood that is still visible. They were great rearers of horses. Our knowledge of them is derived chiefly from the Romans, with whom they came first into contact in the Jugurthine War. The name soon came to be synonymous in Rome with "Africa" and "African." They gave the Romans much trouble till they were finally subdued by Lentulus, who took the surname of Gætulicus. The country had some renown in the Middle Ages, and it is thought that the name may still be traced.

Gaff, a kind of boom used to extend the upper edge of the mizen, its foremost edge being furnished with two cheeks to embrace the after-part of the mast. A gaff topsail is a light, three- or four-sided sail on the mizen topmast, its head in the latter case extended by a small yard and its foot extending along the length of the gaff.

Gage, THOMAS (1720–1787), an English general, was the son of the first Viscount Gage. He was

born in England, and entered the army while young. In 1750 he was lieutenant-colonel of the 44th Regiment, in 1761 was major-general and governor of Montreal, and in 1763 became commander of the British forces in America, with the title of governor of Massachusetts. His hesitation in dealing with the Boston rioters gave the colonists encouragement and opportunity, and in 1775 the defeat of a detachment which he had sent to Lexington virtually began the War of Independence. Although he gained the battle of Bunker's Hill, he could not raise the siege of Boston, and he was soon after superseded by General Howe.

Gage, SIR WILLIAM HALL, naval officer, was youngest son of General the Hon. Thomas Gage, and was born in 1777. He served with Sir John Jervis in the *Victory*, and with Nelson in the *Minerve*, and was present at the battle of Cape St. Vincent. Having been made a commander in 1797, and a post-captain in the same year, he distinguished himself in the command successively of the *Terpsichore*, 32, the *Uranie*, 38, the *Thetis*, 38, and the *Indus*, 74. He became a rear-admiral in 1821, and was from 1825 to 1830 commander-in-chief in the East Indies, and from 1834 to 1837 commander-in-chief on the Lisbon station. He reached the rank of vice-admiral in 1837, that of admiral in 1846, that of admiral of the fleet in 1862, and died in 1864. From 1842 to 1846 he was a lord of the Admiralty, and from 1848 to 1851 he was port-admiral at Devonport. He was knighted in 1834.

Gagern, HANS CHRISTOPHER ERNST, BARON VON (1766-1852), a German statesman and writer, was born near Worms. He was educated at Leipzig and Göttingen, and entered the service of the Prince of Orange-Nassau. He was ambassador to Paris till a decree of Napoleon made it impossible for him to hold the post longer. He then went to Vienna, and tried to rouse a movement against Napoleon in the Tyrol. He was, after the fall of Napoleon, Prime Minister to the King of the Netherlands (Prince of Orange), and represented him ably at the Congress of Vienna in 1815. From 1816-18 he was the Netherlands ambassador to Germany, and in 1820 he retired upon a pension, but still exerted a good deal of influence upon public affairs.

Gahnite consists of an aluminate of zinc (ZnAl_2O_4), which crystallises in the regular system, usually in octahedra, resembling the spinels (q.v.). It varies in colour from green to blue-black or brown; has a specific gravity of 7.8, and hardness 4.5. It frequently contains, besides its chief constituents, iron or manganese and sometimes magnesium. It occurs in a few localities in Sweden, Bavaria, and America, but not very plentifully.

Gaikas (AMA-NGQIKA), a branch of the Ama-Xosa Kafirs, being descended through Ngqika (ob. 1828) and Khakhabe from Palo (ob. 1780), tenth in descent from Xosa, reputed founder of the famous Ama-Xosa Confederacy, about the year 1500. In 1817, Lord Charles Somerset, Governor

of Cape Colony, recognised Ngqika as paramount chief of the Confederacy, thus setting aside the legitimate claim of Hinza, who, as grandson of Galeka, elder brother of Khakhabe, represented the senior branch of the House of Xosa. The mistake led to the long series of Kafir wars, which resulted, (1877) in the deposition of the paramount chief, Kreli, and the removal of the few surviving Gaikas to the Transkei District between the Kei and Bashi rivers. The Gaikas are now nearly extinct, but the name survives in the *Gaikas Kop*, a mountain nearly 7,000 feet high, between the Kat river and the Amatola range.

Gainsborough, a market town and port of North Lincolnshire, on the right bank of the Trent, 21 miles above its junction with the Humber, and 16 miles N.W. of Lincoln. It consists principally of one long street parallel to the Trent, which is crossed by a stone bridge of three arches. Vessels of 200 tons can reach the town. The parish church has been rebuilt, but retains its 12th century tower. There is in the town an oak timber-framed hall with a tower 78 feet high, and forming three sides of a triangle, which is said to have been built by John of Gaunt. Part of it is now used as a corn exchange and assembly-rooms. The grammar school dates from 1589. Other public buildings are the town-hall and the court-house. Ship-building, malting, and brewing are carried on, and there are iron and brass foundries, and linseed cake and tobacco factories.

Gainsborough, THOMAS (1727-1788), a noted English painter, was born at Sudbury, in Suffolk. His mother had some taste in painting, and encouraged the boy, who at ten years of age had sketched almost everything about him, and at fifteen went to London to study. His energies were devoted chiefly to portrait-painting, but landscape came in for its share of attention. Having married a young woman with a little money, he settled down for a time in Suffolk, and often painted landscapes on the Orwell. In 1759 he went to Bath with his wife and daughters, and there he painted many portraits, among his sitters being Sterne, Richardson, Quin, Henderson, and Garrick. In 1774 he was in London and prospering, and exhibited portraits and landscapes. He was called to Court, and enjoyed both Court and popular favour. Among his sitters at this period were Burke, Clive, and Sir William Blackstone. As a landscapist he was a forerunner of Constable. Among his notable portraits are that of the *Duchess of Devonshire*, at present missing, and that of *Mrs. Siddons*, known to most visitors to the National Gallery, London, which contains several others of his works also, among the landscapes being *A Waggon and Horses Passing a Brook*.

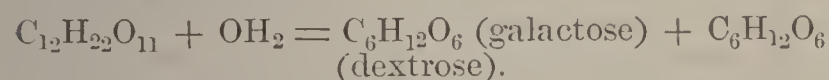
Gairdner, JAMES, born in 1828 at Edinburgh, entered young as a clerk in the Public Record Office, London. In 1859 he became assistant-keeper, and has edited many historical documents, as well as written upon the *Houses of Lancaster and York*, the *Life and Reign of Richard III.*, *Studies in English History*, and a work on *Henry VII.*

Gairdner, WILLIAM TENNANT (b. 1824), elder brother of James, a noted physician, M.D. and F.R.C.P. Edin., and LL.D. Edin., was appointed in 1862 Regius Professor of Medicine in Glasgow University. In 1888 he presided over a meeting of the Medical Association held there, and he is physician-in-ordinary to the Queen in Scotland. Among his special subjects have been the lungs, bronchitis, insanity, and hygiene.

Gaius, a Roman lawyer of the 2nd century A.D., of whom next to nothing is known except his work, not even his family name. A decree of Valentinian declared him one of the five lawyers whose opinions were to have weight. His known works are the *Institutes*, *Commentary on the Twelve Tables*, the *Edicts of Magistrates*, and a work on the *Lex Papia Poppæa*. He was probably a practitioner of the conservative school, and much of his *Institutes* was incorporated in Justinian's *Institutes*, in much the same way that Blackstone's *Commentary* has been utilised by later writers. In 1816 Niebuhr discovered a palimpsest of his MSS. at Verona, and this has proved of great value for the light it throws upon antique procedure, and upon the way in which variation of the "formulæ" constituted a kind of equitable system.

Galactonic Acid. [GALACTOSE.]

Galactose, a sugar containing six atoms of carbon in the molecule, having the composition $C_6H_{12}O_6$, i.e. a *hexose*. It originally received the name *lactose*, but this is now applied to a totally different compound, milk sugar, from which *galactose* itself, together with the isomeric *dextrose*, may be prepared by boiling for some hours with a dilute acid. The lactose then breaks up according to the following equation:—



It is seen that it has the same composition as dextrose, which it further resembles in its action on polarised light, being dextro-rotatory [POLARISATION], in fermenting under the influence of yeast, and in reducing Fehling's solution (q.v.). It forms small prismatic crystals, which melt at 166° , and which are soluble in water, though not as readily as dextrose. It yields by oxidation two acids—(1) *galactonic acid*, $C_6H_{12}O_7$, and (2) *mucic acid*, $C_6H_{10}O_8$, while by reduction it gives rise to a body of the nature of an alcohol, *dulcitol*, $C_6H_{14}O_6$ (q.v.). It is estimated quantitatively in the same manner as dextrose. [See also DEXTROSE, LACTOSE, SUGARS, CARBOHYDRATES.]

Galago, a genus of African Lemmings, with 14 species, often distributed into sub-genera, ranging from Senegal and Fernando Po across the continent to Zanzibar and southwards to Natal. The name is also applied to any individual of the genus. They are arboreal nocturnal animals, clothed in soft woolly fur, with bushy tails longer than the body, and large naked ears, feeding on fruit, insects, and small birds and mammals. The hind limbs are longer and stronger than the fore limbs; and there

are nails on all the digits except on the second toe, which is armed with a claw. The largest, *G. crassicaudatus*, is about the size of a cat, and the smallest, *G. murinus*, said to be gregarious, is no larger than a rat. [LEMUR.]

Galahad, SIR, a knight of the Round Table, who, according to the latest form of the legend of the Holy Grail (q.v.), was, on account of his chastity, the one knight destined to succeed in the quest.

Galangal, formerly written GALINGALE, is an aromatic stimulant drug, apparently introduced into Europe, by Arabian physicians, from China, its name being derived from Kauliang-kiang, "ginger from Kauliang" (Kauchawfu), in Canton. The ordinary galangal of European commerce is the dried rhizome of *Alpinia officinarum*, a member of the ginger family, native to Hainan and probably also to Southern China. The rhizomes are cylindrical, forked, $\frac{3}{4}$ inch or less in diameter, fibrous, striated, and reddish-brown externally with ring-shaped, transverse scars of leaf-scales. It has a pungent odour and a taste resembling Grains of Paradise. Though no longer used in English medicine, galangal is largely employed in Russia in veterinary medicine and cordials. Greater or Java galangal, distinguished by its larger size, orange-brown colour, and feebler odour, though mentioned by Marco Polo, is now rarely imported. It is the rhizome of *A. Galanga*. Galanga cardamoms, used in China, are believed to be the capsules of this species. The preserved ginger from Siam and China is the rhizome of an *Alpinia*. China exports, mainly from Shanghai to India, about 600 tons of galangal annually. The tubers of species of *Cyperus* were formerly used as a substitute for this drug, and Gerard calls *C. longus* "English galingale."

Galapagos, an archipelago consisting of five large and ten small islands in the Pacific Ocean, on the Equator, 500 miles from Ecuador, of which they form part, and to which the three inhabited isles—Albemarle, Charles, and Chatham—formed a penal settlement. They were discovered by the Spaniards in the 16th century, and obtained their name from the multitude of gigantic tortoises, of which the islands contain many species. The islands are of undoubted volcanic origin, as is shown by the great number of craters existing, and by the depth of the sea all round. There is little rain, and much of the soil is rocky and parched. The fauna and flora are extremely interesting on account of the isolation of the position, and the fact that many species are peculiar to particular islands. Darwin and Wallace have both made interesting studies in this direction.

Galashiels, parliamentary borough and manufacturing town on the banks of the Gala, a mile above its junction with the Tweed, partly in Roxburghshire and partly in Selkirkshire, 33 miles S. of Edinburgh. It is an ancient place, and was the seat of the Douglases in the 15th century. Wool had been worked here for long, and in 1790 a new impetus was given by the establishment of the first

factory. But whereas £1,000 represented the output in 1790, this had risen in 1890 to £1,250,000. Formerly, shawls and tartans were manufactured there, but now it confines itself chiefly to the goods known as tweeds. There are between 20 and 30 woollen factories, and there is a large skinery. Galashiels unites with Hawick and Selkirk to send one member to Parliament.

Galata, the name of the business quarter of Constantinople, situated on the N. side of the Golden Horn.

Galatea, the lover of Acis, who was crushed under a rock by Polyphemus the Cyclops, through jealousy. The story has formed the subject of a cantata. The name was also borne by the statue whom Love, at Pygmalion's request, warmed into life.

Galatia, an ancient district of Asia Minor, separated on the N. by the range of Olympus from Bithynia and Paphlagonia; and having on the E. Pontus, on the W. Phrygia, and on the S. Cappadocia and Lycaonia. It is watered by the Halys—which flows through in a northerly direction—and its tributaries. According to Strabo, it was inhabited by three Gallic tribes who had an elaborate system of government and administration. It afterwards became Hellenised, but long preserved its language and other distinguishing features, including the *patria potestas* (Gal. iv. 1). The country is an elevated plateau from 2,000 to 3,000 feet in height, being most level in the S., where it slopes down into the salt desert. The rest is down-land, and feeds many sheep and goats. There is little wood, and in the northern valleys and hills there are great extremes of heat and cold. The people are said to have originated from Gauls who separated from Brennus during his inroads.

Galatians, EPISTLE TO THE. St. Paul's epistle is believed to have been addressed not to the inhabitants of the whole Roman province of Galatia, but to the descendants of the Keltic colony who lived in the district properly so called. [GALATIA.] It is evident from the epistle that the Galatian churches were founded by St. Paul himself, most probably during his visit to Galatia in his second missionary journey (about 52 A.D.), mentioned in Acts xvi. 6. The passage which mentions a second visit, three years later, implies that at that time there were already many disciples. The epistle was probably written soon after 55, and certainly not later than 59 A.D. Its object was to confute the teaching of a "Judaising" section, who maintained the necessity of Jewish observances. In opposition to their views it emphasises the doctrine of justification by faith.

Galatz, a town and port of Roumania, in the principality of Moldavia, on the left bank of the Danube (here 2,000 feet wide), between the mouths of the Pruth and Sereth, 85 miles from the Sulina mouth of the Danube, and 130 miles N.E. of Bucharest. The town is on a plateau, and consists of the Old Town, a badly-built, unwholesome, ill-drained part, liable to floods, and the New Town, in somewhat better condition, on the rising ground

to the N.W. St. Mary's church contains the tomb of Mazeppa. The International Commission, appointed under the terms of the Treaty of Paris, 1856, for the navigation of the Danube, has its seat here, and Roumania has a representative. Ships of 150 tons can come up to Galatz, and there are flour-mills, saw-mills, cooperage works, and much exportation of grain.

Galaxy, or MILKY WAY, is a luminous belt of stars, nearly surrounding the heavens in a complete circle. It is in one thick band for about two-thirds of its length, but for the remainder it is divided into two parallel strips. It intersects the ecliptic near the solstices at about an angle of 60°. It is composed almost entirely of small stars of the eighth and higher magnitudes. In it are a great number of star clusters, but not many true nebulae. Certain parts are so thick with stars that they cannot be counted. The two Herschels made careful estimates of the number of stars in various parts of the galaxy and of other regions of the heavens, but by reason of unfounded assumptions concerning the size and distance of the stars they arrived at incorrect conclusions as to the structure of the heavens. It is now generally understood that the great mass of stars in our stellar system lie in or near a plane passing through the Milky Way; they are contained, in fact, in a disc-shaped region, whose diameter is about ten times its thickness. They are not arranged with anything like uniform distribution, but in irregular clusters. Our own sun is a member of the system, and occupies a position near the centre of this region. The rest of the heavens on each side of the Milky Way is comparatively starless, but contains a large number of nebulae. [STARS.]

Galba, SERVIUS SULPICIUS (A.D. 3-69), a Roman Emperor, was a promising youth, and seemed capable of great things. He was consul in 33, and administered several provinces as proconsul. When the hatred of Nero grew too strong, the soldiers sounded Galba as to being emperor, but he hesitated till he knew that Nero had designs on his life. He was not pleasing as emperor to those who had created him, as he would not bribe the soldiers or pamper the populace. Hence his murder.

Galbanum, a balsamic gum-resin, light-brown, yellowish or greenish-yellow, translucent, with a musky smell and an acridly bitter taste. It contains a blue oil identical with that of chamomile. Galbanum is mentioned as a spice in Exodus xxx. 34, and as a medicine by Hippocrates, Pliny, and Avicenna. It is now administered as an anti-spasmodic, expectorant, and stimulant; but is inferior to asafoetida. Galbanum is apparently the product of the umbelliferous species, *Ferula galbaniflua* and *F. rubricaulis*, natives of Persia, and of *F. Schaïr*, native to Turkestan. It is imported in small quantities from Bombay and the Levant.

Galchas, the aboriginal Aryan population of the Central Asiatic highlands, still forming the dominant element in Kohistân, Ferghâna, Roshân, Wakhân, Karateghin, Shighân, and Badakhshân. Although commonly described as "Highland Tajiks,"

the Galchas constitute a distinct primitive group intermediate between the Indian and Iranian Aryans, and should consequently not be confounded with the Iranian Tajiks, from whom they differ as much as these do from the Persians. They belong, not to the dark, but to the fair division of the Caucasian family [CAUCASIC RACE], being of tall stature and light complexion, with brown, hazel, or blue eyes, chestnut, ruddy, or blonde hair, wavy and curly, thick beard, and extremely brachycephalous skull, in this respect closely resembling the primitive Celtic peoples of Savoy, Auvergne, and Brittany. [CELTS.] Their chief divisions in Kohistân are the Maghians, Kchtoutes, Falghars, Matchas, Fâns, and Iagnôbs, all of whom speak Aryan dialects more akin to the Iranic than to the Indic branch of the Aryan mother-tongue. That of the Iagnôbs appears to be of an extremely archaic type, and its study, scarcely yet begun, is expected to throw much light on the mutual relations and divergencies of the Asiatic members of the Aryan family. With the Central Asiatic Galchas must also be grouped the Siah-Posh Kafirs of Kafiristân and the other primitive peoples of the southern slopes of the Hindu-Kûsh range, whom they closely resemble in physique and probably also in speech. The Galchas proper of Kohistan, numbering altogether about 33,000, are mainly monogamists and Sunnite Mohammedans, though still preserving many usages and ceremonies, evidently derived from the old Mazdean religion of East Irania. They are occupied chiefly with agriculture, and also possess some cattle, horses, and other live-stock. (G. de Meyendorff, *Voyage à Boukhara*, Paris, 1826; Ch. E. de Ujfalvy, *Expédition . . . en Russie, en Sibérie, et dans le Turkestan*, Paris, 1878-79.)

Galekas (AMA-GCALEKA), a historical Kafir nation, named from a chief, Gcaleka, who flourished towards the close of the 18th century, and who was lord paramount of the Ama-Xosa confederacy. [GAIKAS.] The original Galeka territory, which lay between the Kei and Bashi rivers, was annexed to Cape Colony after the last Kafir war of 1877, and now forms, with Bomvaniland, one of the Transkei administrative districts. But the present Galeka-land stretches from the mouth of the Kei to the Umtata, with a total area of 1,350 square miles and population of 65,000 Galekas and 12,000 Bomvanis. Kreli, third in descent from Gcaleka, was one of the most renowned of Ama-Xosa warriors, and since his defeat and deposition by the English in 1877, peace has prevailed throughout Kafirland.

Galelas, an enterprising people of North Jilolo, Eastern Archipelago, who belong to the Indonesian division of the Malayo-Polynesian races. "They build large and roomy praus with outriggers, and settle on any coast or island they take a fancy for. They hunt deer and wild pig, drying the meat; they catch turtle and tripang; they cut down the forest, and plant rice or maize, and are altogether remarkably energetic and industrious. They are a very fine people, of light complexion, tall and with Papuan features, coming nearer to the drawings and descriptions of the true Polynesians of Tahiti

and Owyhee than any I have seen" (A. R. Wallace, *The Malay Archipelago*, 5th ed., p. 325). Those, who are classed by the Malays as "Alfuros"—that is to say, non-Mohammedans or Pagans, speak a distinct language, which shows scarcely any resemblance to the Malayan group.

Galen, an ancient medical writer (*circa* 130-200 A.D.), was born in Mysia. He was trained in the Stoic philosophy, and was proficient in logic, on which he wrote much—only one, however, of his treatises (that on *Certain Fallacies*) being extant. In 146 he began the study of medicine, and went to Smyrna to follow up the subject. In 158 he returned to his native town, Pergamus. In 164 he went to Rome, where he acquired a good practice and a great reputation for learning. In 170 he accompanied Marcus Anrelius to Rome, and was made medical guardian of his son, Commodus, and here he died at 70. He is said to have written as many as 500 treatises. On many medical points he is still an authority.

Galena, lead-sulphide (PbS), by far the most important ore of lead (q.v.), is a lead-grey metallic mineral, tarnishing somewhat on exposure, crystallising in the Cubic system, in cubes or in combinations of the cube and regular octahedron, or occurring massive. Its hardness being 2.5, it will mark paper. Its specific gravity is 7.3 to 7.6. In composition it is about 86.6 per cent. lead and 13.4 sulphur; but there is generally a proportion of silver (q.v.) present. When galena is sufficiently *argentiferous*, the precious metal is extracted by Pattinson's process. Galena occurs in veins, abundantly in clay-slate in Cornwall and Devon, associated with ores of copper and zinc, in the Carboniferous Limestone of Lanark, Derby, etc., and in various localities in France, Germany, Belgium, and the United States.

Galerites, one of the best known fossils of the Chalk. It is an Echinoid with a conical test, a central mouth, and with the anus also on the under side. They are known to the quarrymen as "fossil sugar loaves."

Galerius, VALERIUS MAXIMUS (d. 317), a Roman Emperor, who was born in Dacia, and served with distinction in the army. In 292 Diocletian gave Galerius his daughter in marriage, and made him Cæsar. He defeated the Persians, and when in 305 Diocletian abdicated, Galerius took the eastern half of the Empire, retaining the power till his death, while Constantius ruled in the West. Galerius was a good soldier and commander.

Galibi, a branch of the Carib race, who were formerly very numerous and powerful on the coast-lands of the present French colony of Guiana. Poncet de Bretigny, who led an expedition to that region in 1643, found that all the previous French settlers had either been exterminated or assimilated to the Galibi people. They had forgotten their mother-tongue, and had adopted both the language and usages of the Galibi. Akin to these coast tribes are the Galibios of the Upper Parana basin, Brazil, who are regarded by some authorities as the primitive stock of the Carib race.

Galicia. 1. An Austrian crown-land, having Russia to the N. and E., Hungary S.W., and on the W. Austrian and Russian Silesia. Its area is 30,000 square miles. The Carpathians occupy a third, and most of the rest is a succession of terraces descending to the plain of Russia, with some low land near the Vistula. There are two heights in the Carpathians of 6,000 and 7,000 feet respectively. Its rivers belong partly to the basin of the Baltic, partly to that of the Black Sea, the tributaries of the Vistula being in the former, and the Dniester in the latter. There are a few lakes and many morasses, and several mineral springs. The climate is severe, and much of the land is forest. There is some coal, iron, lignite, zinc, and salt, and Cracow is the seat of the iron manufacture. Corn, hemp, flax, and tobacco are grown, and horses, cattle, and bees are reared, and there is a good deal of transit trade done down the Dniester. The towns of Lemberg and Cracow have each a university. The inhabitants are chiefly Poles and Ruthenians. The Austrians first got a footing in Galicia in 1772, and it was not until 1846 that they finished acquiring it.

2. An ancient kingdom of N.W. Spain, now containing Corunna and three other provinces, is on the Bay of Biscay and the Atlantic, being 125 miles long by 115 broad, and having an area of 11,222 miles. The Pyrenean chain runs through Galicia from E. to W., and two spurs branch off in a S.E. direction, enclosing the basin of the Minho, which is the chief river, and has a course of 170 miles to the Atlantic. The Minho has many tributaries, and there are other rivers, those to the N. having short, turbulent courses. The coast-line of 240 miles has many good harbours, among them being Vigo Bay, the port of Corunna, Vivero Bay, and the Rivadeo. The climate is mild, and there is much rain, rendering the land fertile. Timber, cattle, and pigs—which feed under the oaks and chestnuts—fruits, game, and fish are abundant. Lead, tin, copper, and iron pyrites are found, and there is some manufacture of linen and cotton. The chief exports are cattle, sardines, preserved meat, chestnuts, nuts, and potatoes. Most of the people are engaged in agriculture, and the native Gallego is looked on as a good-natured but thick-headed fellow.

Galignani, JOHN ANTONY (1796–1873) and WILLIAM (1798–1882), two Parisian publishers, were the sons of an Italian who set up an English library in Paris in 1800, and in 1814 founded *Galignani's Messenger*. The sons took his work on, and did much to advance English interests in France.

Galilean Telescope is the simplest form of telescope, invented by Galileo, and employed most usefully by him in his observations on the heavens. It consists simply of two lenses—an *object* or *field-glass* and a concave *eye-piece*. The object-glass would of itself give an inverted image of the object, but the eye-piece is placed so as to prevent the formation of a real image from the field-glass, and the result is that an enlarged *erect* image is obtained. Opera-glasses are constructed on this principle; they have the advantage of showing

objects in their right position, an advantage which is not shared with ordinary telescopes. Possessing only two lenses, it absorbs but little light; but because of the divergence of the waves of light, as they emerge from the concave eye-piece, it is necessary that the eye shall be placed very near the eye-piece. The invention is strictly due to a Dutchman, Jacques Metins, who discovered it by accident in 1609. By its means Galileo discovered the mountains of the moon, Jupiter's satellites, and the spots on the sun. [TELESCOPE.]

Galilee, one of the four Roman divisions of Palestine, is in the N. and extends from the Mediterranean to the Jordan. It is now part of the pashalic of Damascus in Syria. The upper part is generally hilly and well-wooded; the lower, level and fertile, though great irregularities of formation give evidence of volcanic action. The principal inhabitants of old times were Syrians, Arabs, Phoenicians, Greeks, and some Jews, who were much despised by their co-religionists at Jerusalem. The principal towns were Tiberias, Cana, Capernaum, Nazareth, and Nain. Tiberias, after the fall of Jerusalem, became a great seat of Rabbinical learning. The Sea of Galilee is a large lake about 13 miles long and 7 in width, and 820 feet deep, lying at the bottom of a great volcanic basin, and containing clear fresh-water well stocked with fish. To the S. lies the Jordan valley, and the river enters the lake through a narrow gorge.

Galileo (properly GALILEO GALILEI), 1564–1642, a great astronomer, born at Pisa, of an ancient noble family. As a boy he was fond of literature, and of making toy machines. He was educated at the monastery of Vallombrosa, near Florence, and then studied medicine at Pisa university. In 1583 the sight of a lamp swinging in the cathedral at Pisa set him investigating, and shortly after this time he began to study mathematics, and this gave a new direction to his genius. In 1586 he invented a hydrostatical balance, and in 1588 he published a treatise on the centre of gravity in solids. He became a lecturer in the university, and from 1589 to 1591 was occupied in experiments, but offended many by his outspokenness. From 1592 to 1610 he occupied the chair of mathematics at Padua, and gained much reputation. In 1597 he constructed the first thermometer, but his great feat was in so improving the telescope as to be enabled to make many discoveries till then undreamt of. He was formally prohibited by the Pope from teaching the Copernican doctrines, but having ridiculed the accepted or Ptolemaic theories in 1632, was summoned before the Inquisition, perhaps tortured (but this is very doubtful), and sentenced to imprisonment during the Papal pleasure. He was, however, released, and permitted to reside at Florence. He continued his researches, but became blind and died in retirement. For the present Roman Catholic view of his case, see W. G. Ward, *Dublin Review*, 1871.

Galipot, the resin which exudes from incisions of old standing in the maritime pine (*Pinus maritima*) of Bordeaux.

Galitzin, a Russian family of much note, the chief members of which have been:—(1) VASILI (b. 1643), who was the regent during Peter the Great's minority, and who did much to introduce Western influence into Russia. His desire to marry Sophia brought about his downfall. (2) DIMITRI (1735–1803), who was ambassador to Holland, and was a friend of Voltaire. (3) DIMITRI, son of the above (1770–1840), became a Catholic, and was ordained a priest, being known as "Father Smith." He was vicar-general of Philadelphia, and founded the town of Loretto in the Alleghanies. His inheritance was forfeited, owing to his refusal to return to Russia.

Gall, FRANZ JOSEPH (1758–1828), a German physician, born at Tiefenbrunn. In early days he formed a theory that internal qualities corresponded with external conformation, and this led to the development of his system of phrenology, on which, with Spurzheim, he lectured in Germany. His doctrines did not meet with great success, and he went to Paris in 1807, and in 1819 became a French subject. In 1820 he visited London with a view to lecturing, but was disappointingly received. He wrote works on phrenology, some of them being written in conjunction with Spurzheim.

Galland, ANTOINE (1646–1715), a French Orientalist, was born in France. He was employed to catalogue Oriental MSS. for the Sorbonne, and in 1670 was attached to the French Embassy at Constantinople. In 1673 he went to Syria and the Levant, and collected many antiquities. Between 1676 and 1679 he made other journeys to the Levant, and after his return he studied thoroughly Arabic, Turkish, and Persian. In 1704 he made a translation of the *Arabian Nights*, and in 1709 was appointed to the chair of Arabic in the Collège de France.

Galla Ox, an Abyssinian variety of *Bos taurus*, with very long lyrate horns.

Gallas, a people of north-east Africa, who form a main branch of the Ethiopic or Eastern division of the Hamitic race. Their domain comprises the whole of Gallaland, Enarea, and Kaffaland, together with large tracts of Shoa and Gojam (South Abyssinia), and most of the little-known region extending from Kaffaland through the Lake Rudolf (Samburu) depression southwards to the Tana river and eastwards to the Upper Juba basin. The Gallas are thus conterminous on the north and east with the Abyssinians, the Afârs, and the kindred Somali, on the west with the Nilotic Negroes and the remotely-connected Masai, southwards with the Wa-Pokomo and other Bantu peoples of the Tana basin, their territory having a total area of nearly 400,000 square miles, and a population roughly estimated by Krapf at from six to eight millions. Being Hamites, the Gallas belong to the same Caucasian division of mankind as the Europeans [CAUCASIC RACE], and they are physically, perhaps, the finest people in Africa, tall, well-proportioned, with high, broad forehead, aquiline nose, well-cut mouth, oval face, coppery or light chocolate complexion, and black kinky hair usually worn in short

ringlets or "finger curls" round the head. In their mental qualities and natural intelligence they compare favourably with all the surrounding populations, so much so that Galla slaves have always commanded the highest price in the Soudanese markets. Their language, spoken with considerable uniformity throughout the Galla domain, is a distinct member of the Hamitic family, closely related to the neighbouring Somali and intermediate between the western Masai and northern Dankali (Afâr). The term *Galla*, although of native origin, meaning "conquerors," is not the national name, their most general designation being *Orma* (Oroma), "men, stout, valiant," and more fully *Ilma'orma*, "sons of the brave." Galla, however, already figures on Fra Mauro's map (1459), where the lower course of the Xebe (Juba) is called the *fluvio di Galla*. But the earliest reference to the race occurs in the celebrated Greek inscription of the first century found at Adulis (Annesley Bay), where mention is made of the *Arousi* people south of Shoa, near the territory of the present *Arussi*, who are still one of the most powerful branches of the Galla nation. The tribal divisions are past counting, and each tribe comprises two sections, the *prutuma* or herdsmen, and the *kutto* (*argatta*) or tillers of the soil, the former being the superior or aristocratic, the latter the plebeian class. It is evident that originally the *Ilma'orma* were essentially a pastoral people, who at some remote period penetrated most probably from the north-east into their present domain, where they still regard themselves as invaders, *Ilma Galla*, "sons of the conquerors." Here many of their tribes have at various times been brought under Abyssinian and Arab influences, while others have hitherto kept entirely aloof; hence some are still pagans, some Mohammedans, some Christians of the Abyssino-Coptic sect, these latter being collectively called *Sidama* Gallas. Hence also, despite a certain vague sense of a common nationality, the several groups have long been animated by mutual feelings of hostility, intensified by the Mohammedan slave-hunting expeditions. They live in a chronic state of inter-tribal warfare, and many of the *prutuma* class lead a restless nomad existence, raiding the more sedentary *kutto*, and plundering wayfarers and caravans along the trade routes. The national arms are the spear, sword, and shield, and most of the northern tribes fight mounted on small, wiry, and mettlesome horses. The men wear a cotton loin-cloth, saturated with butter, to which the wealthy add drawers and a short skirt, resembling the Scottish kilt. They adorn themselves with ivory armlets, adding one for every enemy killed in battle, while the women are decked with copper or tin bracelets and a profusion of glass beads worn round the neck, their costume consisting of a dressed skin smock and a short tunic. Polygamy is permitted, and the women occupy a degraded position in most of the tribes, in which the communal system forms the basis of the social organisation. All authority is centred in the *prutuma* class, which is grouped in *pakhidaks*, with a council of a hundred elders at their head elected for 16 years. These elders elect in their turn an assembly of 300

members, by whom is chosen the *buku-el-kebir*, or great tribal chief. (Krapf, *Travels, etc.*, London, 1860; Ch. Tatschek, *Grammar and Dictionary of the Galla Language*, Munich, 1844-45; C. Beke, *On the Origin of the Gallas*, in *Report of the British Association*, for 1847; Harris, *The Highlands of Ethiopia*, vol. iii.)

Gallatin, ALBERT (1761-1849), was born and educated at Geneva. In 1780 he went to the United States, and taught French at Harvard. He then acquired property and entered into politics, and in 1801-13 was Secretary to the Treasury, showing great powers of finance. In 1814 he negotiated the peace with England, and from 1815-23 was ambassador to Paris. He wrote on finance, politics, and ethnology, on the Indian tribes, and on the semi-civilisation of Mexico, Yucatan, and Central America; and he was the first president of the Ethnological Society of America.

Gall Bladder. [LIVER.]

Galle, a fortified town in the S.W. of Ceylon (q.v.). It is situated on a low rocky promontory, and has a good harbour in a small bay, which, however, has become of less importance since the construction of a breakwater at Colombo. The town is beautifully provided with trees, and has some interesting old Dutch buildings.

Gallein ($C_{20}H_{10}O_7$) is employed as a dye under the name of *anthracene violet*. It is obtained by heating a mixture of pyrogallie acid and phthalic anhydride. It forms green crystals, which dissolve in alcohol to a red, and in potash to a red or blue solution, the colour in the latter case becoming blue by addition of excess of potash. It produces colours varying from bluish to red purples. By the action of sulphuric acid it gives rise to *cærulein* (anthracene green), which is also employed in dyeing for the production of various shades of olive-green.

Galleon, anciently, a ship of war of the largest size, with three or four decks of guns; but, in the 18th century, one of the large Spanish merchantmen employed in regular voyages to the Indies and elsewhere, and usually having four decks, and carrying guns. Until after the commencement of the present century the galleons sailed yearly from Cadiz, and were away for about two years. The chief ones brought home the produce of the Potosi silver mines, and also much gold, precious stones, wool, quinine, skins, leather, etc. The number of galleons varied, and was greatest in time of war; but a single one with her cargo was often worth nearly two millions sterling.

Gallery, in Elizabethan houses and some of earlier date, was a long narrow apartment, frequently in the upper storey, which served either as a passage or as a place where entertainments could be held. But the word was, and is, commonly used in a sense equivalent to that of "loft"—i.e. a platform or raised stage inside an apartment. Such was the Minstrels' Gallery at the lower end of the great hall in ancient mansions, which was set apart for the musicians. In mediæval churches

there was usually a wooden gallery over the rood-screen (q.v.), between the chancel and the nave. It was called a Rood-loft, because it was surmounted by a large cross or rood. In other parts of the church stone galleries were erected for the accommodation of worshippers. Norman examples remain at the west end of the north transept in Winchester cathedral, but they are less common in England than in France or Germany, where they are commonly found at the west end. The triforium (q.v.) also, which forms part of the original structure, is essentially a gallery. In foreign cathedrals seats are still sometimes placed here for the congregation, and in ancient days it seems to have been used for the actual celebration of service. The wooden galleries now common in churches were introduced after the Reformation.

Galley, a low, flat-built vessel, originally peculiar to the Mediterranean, having one, two, or three masts with lateen sails, a raised and covered poop and forecastle, and a long open waist, in which, upon one or two tiers of benches, sat slaves, chained to the huge sweeps by means of which the craft was mainly propelled. The galley generally carried guns upon the forecastle, and occasionally also on each quarter. The largest galleys, called galeasses, had a total length of as much as 162 feet, and a beam of 32 feet, with 64 oars and about 350 rowers. The galley of a ship is the general kitchen or cook-room. A galley is also a name given to a light pulling boat, such as is reserved to the use of the commanding-officer of a man-of-war.

Gall Flies. A series of insects belonging mostly to the *Cynipidæ*, a family of the Hymenoptera (q.v.), though some are members of other orders, such as the *Cecidomyidæ*, which belong to the Diptera or true flies. The galls themselves are vegetable, and are pathological growths of the tissues of a plant in the effort to surround some parasitic insect larva, or to heal the wounds it has produced. The best-known English galls are the common "oak-apples," formed on oaks by the *Andricus terminalis*, one of the Hymenoptera. The gall-nuts of commerce, which are of great importance in the arts, as they are used largely in the manufacture of inks and dyes, are similar galls: they are formed by species of the type genus *Cynips*. Another common type of galls occurs on the undersides of leaves; they are usually in the form of small hard discs: the so-called "oak-spangles," due to the larva of *Neuroterus lenticularis*, is a familiar example of this series. A third class of galls occurs as soft, mossy, or bush-like growths, instead of hard nodules or discs: the "bedeguar" of the rose is a familiar type of this group; it is due to the attacks of *Rhodites rosæ*. The gall insects present an interesting case of the "alternations of generations" (q.v.), for they are dimorphous. The gall flies are generally winged, but in many cases series of apterous, or wingless generations, intervene between those which are winged. The former are strikingly different in appearance from the latter, as the wings of these are very large in proportion to the body.

Galliard, a spirited dance, in high favour in the 16th and 17th centuries: the same as the Italian *romanesca*. It was confined to two dancers, and out of it was developed the minuet. The music accompanying it had a triple rhythm, and was lively but not rapid.

Gallic Acid has the composition $C_6H_2(OH)_3COOH$, being *trihydroxybenzoic acid*. It occurs in various plants as sumach, tea, dividivi, etc., and in gall-nuts. It is found, also, combined in various tannic acids or tannins, from which it may be obtained. Thus, ordinary tannic acid, if boiled with a dilute acid, breaks up into gallic acid—



It may be prepared in this manner, or by exposure of an infusion of gall-nuts to air, the addition of a little yeast accelerating the formation. It crystallises in fine silky needles, slightly soluble in cold, and readily in hot, water, the solution possessing an astringent, slightly acid taste. If heated, it is converted into *pyrogallol*, the *pyrogallic acid* of the photographer. The reaction is thus expressed—



It acts as a strong reducing agent, precipitating silver from its solutions. It may be recognised by the fine blue-black precipitate it gives with ferric salts, and by the rapid colouring (green, then brown) of alkaline solutions when exposed to air. It is employed for making inks, and, to some extent, medicinally as an astringent.

Gallican Church, a name given to the Roman Catholic Church in France, with special reference to the opposition which it formerly displayed to Papal claims. Christian churches must have been founded in Gaul before the latter part of the 2nd century A.D., for during the persecution under M. Aurelius, many suffered martyrdom at Lyons, including Pothinus, bishop of the town. Irenæus, the successor of Pothinus, had been a disciple of Polycarp, and this fact, together with the constant connection maintained with Smyrna, and the general sympathy with Eastern views, leads to the conclusion that the Church of Gaul was mainly, if not entirely, of Asiatic origin. Like other branches of the Church, it advanced rapidly after the establishment of Christianity under Constantine; but it passed through a severe struggle during the invasion of the barbarian races, most of whom had already adopted the Arian form of Christianity. It was saved from the Arians by Clovis, and both he and his successors saw that a steady union with so strong an organisation was the surest means of maintaining the power of their own dynasty. As the power of the Papacy became established amidst the political and social confusion which followed the death of Charlemagne, the Church in France, as in other countries, sought to extend its own influence and authority by complete submission to the claims of the Roman See. The Pragmatic Sanction of 1269 subordinated the authority of the Pope to the common law of the country as well as the canons of councils, and the same course was pursued more boldly by Philip the

Fair in his struggle with Boniface VIII. The degradation of the Papacy during the "Babylonish Captivity" led to still further limitations of its power. The enactments of general councils took the place of Papal decrees as the source of authority in ecclesiastical matters; by those of Constance and Basel, Church patronage was in great measure transferred from the Pope to the Crown, and the privileges thus gained were confirmed by the Pragmatic Sanction of Bourges (1437). The concordat of 1516 gave the right of instituting bishops to the Pope, while that of nominating them was retained by the Crown; but the French people still looked back to the Pragmatic Sanction and the decrees on which it was based as the most fitting expression of the relations which should exist between Church and State. The movement towards "Gallicism" reached its height in the reign of Louis XIV., who was determined to assert his supremacy in ecclesiastical as well as civil affairs. In his contest with Innocent XI. concerning the Regalia (q.v.), he was supported by the eloquent and influential Bossuet (q.v.), who drew up the famous Declaration of the French clergy in 1682. This Declaration was condemned by several Popes, but the Crown maintained the same attitude up to the time of the Revolution. In 1790 an attempt was made by the "civil constitution of the clergy" to reorganise the Church on a democratic basis. At the same time a violent attack was made on ecclesiastical privileges; the clergy were deprived of their tithes, and the Church lands were confiscated. During the Reign of Terror public worship was suspended, and the Church for a time ceased to exist. By the concordat of Napoleon, then first consul, with Pius VII., in 1801, the Church was re-established and public services were resumed; but most of the changes introduced during the early part of the Revolution were retained. In 1810 Napoleon, now emperor, returned to the Declaration of 1682. In 1817 there was a new concordat, by which that of 1516 was again recognised; but in 1826 a full assembly of bishops expressed their adhesion to the principles of 1682. In 1830 all creeds were placed on the same footing. The course generally followed by the State in ecclesiastical and religious matters since that date has completely alienated the Church, which is now decidedly Ultramontane (q.v.) in its tendencies. The strongest proof of this was given at the Vatican Council of 1870, when the French bishops accepted the doctrine of the infallibility of the Pope.

Gallienus, PUBLIUS LICINIUS (Roman Emperor 260—268 A.D.), was the son of Valerian, who made him his colleague in the government. When his father was imprisoned by the Persians, the son lost all energy, and reigned only in Italy, the rest of the empire being governed by different generals, who earned the name of the Thirty Tyrants. Gallienus was murdered while besieging Milan.

Gallinaceous Birds, the RASORES of some authors, an old order of Birds (q.v.), containing the Game Birds, Sand-grouse, Bush Quails, Mound Birds, Curassows, Tinamous, and in some cases the Pigeons. The Linnæan term Gallinæ is now often revived in

this sense, and the Pigeons are generally given ordinal rank.

Gallinule. [MOORHEN.]

Gallio, JULIUS ANNÆUS (1st century), was born at Cordova, and was the brother of Seneca the philosopher. He came to Rome, and was adopted by Gallio, whose name he took. During the reign of Claudius he became proconsul of Achaia, and is said to have been afterwards one of Nero's latest victims.

Gallipoli (1) (ancient *Kallipolis*), is a seaport of Turkey in Europe, at the N.E. extremity of the Dardanelles, on a peninsula, 90 miles S. of Adrianople, and 130 miles S.W. of Constantinople. It is a poor town, but has good bazaars, some mosques, and Roman and Byzantine remains. It is a key of the Dardanelles, and was occupied and strengthened by the English and French in 1854. There is a lighthouse on the cliff. (2) A seaport of South Italy, in the province of Lecce, 25 miles N.E. of that city and 50 miles S. of Brindisi. It is on a rocky isle to the E. of the Gulf of Taranto, and a bridge of 12 arches unites it to the mainland. It has a cathedral, a castle built by Charles III. of Anjou, and huge underground cisterns, hewn in the rock, for storing the olive oil produced in the district. There is a good deal of tunny-fishing.

Gallium, a metallic element of atomic weight 69.8, which was discovered by Boisbaudran in a particular variety of zinc ore in the year 1875. He became aware of its existence by means of spectrum analysis (q.v.), and, although it exists in the ore in only very small quantities (about 1 part in 60,000), he succeeded in obtaining sufficient for examination. It is a bluish-white metal, which melts at 30° C., and when melted may remain so for several weeks, even at much lower temperatures, but instantly solidifies if touched by the solid metal. It is tough, and has the specific gravity of 5.9, is soluble in hydrochloric but not in nitric acid. It is best detected spectroscopically, being recognised by two lines in the violet end of the spectrum. The discovery was rendered more interesting by the fact that the element was found to agree almost completely with the description of a metal whose existence was predicted by Mendeleef in 1870 on the ground of his Periodic Law, and called by him *Eka-aluminium* (q.v.).

Gallocyanines, a number of blue and violet dyes, which are obtained from gallic acid and some of the tannins by the action of certain aniline derivatives—nitrosodimethylaniline. That from gallic acid is the best known, and receives the name *solid violet*. They give blue, violet, or red solutions, according to the solvent employed, frequently exhibiting a fine fluorescence. For dyeing cottons a tin or chromium *mordant* is generally employed, but for the dyeing of silk or wool no mordant is necessary.

Galloflavin, a yellow dyestuff obtained by the oxidation of gallic acid. This is usually accomplished by blowing air through a solution of the acid in dilute potash until a precipitate occurs,

which is afterwards treated with a dilute acid. By recrystallisation it is obtained in yellow crystals, which dye cotton yellow, the shade varying with the mordant employed.

Gallon is the standard of liquid capacity in the United Kingdom. It is a very old measure, one of Henry VII. being of capacity 274½ cubic inches, of Queen Elizabeth 282 cubic inches, and of Queen Anne 231 cubic inches. These were abolished in 1824, when the present standard imperial gallon was introduced. It is defined as the capacity of 10 pounds of distilled water weighed in air at a pressure of 30 inches of mercury and a temperature of 62° Fahr. This has a volume of 277.274 cubic inches, and is, therefore, very nearly the same as the old Winchester corn gallon of Henry VII. The quart is the fourth part of the gallon, and is further subdivided into 2 pints.

Gallo-tannic Acid. [TANNIC ACID, TANNINUS.]

Galloway, a district in the S.W. of Scotland, now almost coextensive with Wigtonshire and Kirkcudbright, but formerly much larger. It is 70 miles long by about 40 miles broad, and has long been famous for its breed of small horses and black cattle. The chief occupation, however, now of its inhabitants is dairy-farming, for which its mild and genial climate admirably suits it. The surface is in parts mountainous, and there are many lakes and streams. In the Roman period Agricola is thought to have made a strong settlement here, and the many Roman remains seem to confirm this view. The name is said to be derived from Gall-Gael or foreign Gaels, and, though the natives were subdued by the English in the 7th century, they preserved their language till the 16th century, and many of the local names have a Gaelic appearance.

Galloway, MULL OF, the southernmost point of Scotland, 23 miles S. of Stranraer, at the end of a peninsula called the Rhinns of Galloway. The promontory, which is a little more than a mile long and about a quarter of a mile broad, is 210 feet high, and has a lighthouse, whose light is visible 23 miles out to sea, and which commands a view of the Isle of Man, the Irish coast, and the Cumbrian mountains.

Galls. [GALL FLIES.]

Gallus, (1) TREBONIANUS (251–253), a Roman Emperor, who succeeded Decius, and was murdered by his troops. He is remembered for having paid the Goths to leave Rome alone. (2) C. CORNELIUS, a Roman poet, the friend of Virgil and Ovid. He was born 66 B.C., and committed suicide somewhere about 26 B.C. from chagrin at being banished for maladministration in Egypt. Of four books of elegies upon his mistress, Lycoris, only fragments are left.

Galt, JOHN (1779–1839), a Scottish novelist and trader, was born at Irvine, in Ayrshire. After a desultory education, he became a clerk at Greenock, but his versatility of character soon took him to London, where he tried his hand at literature, and entered at Lincoln's Inn, and after projecting a

Life of Wolsey, he embarked for the Continent upon an errand connected with the embargo laid upon British commerce by Napoleon. In the course of this voyage he visited Greece, Constantinople, and Asia Minor, and made the acquaintance of Lord Byron. After returning to London, he made another voyage to Gibraltar with a similar object. These voyages he commemorated in *Voyages and Travels* and in *Letters from the Levant*, but these works were not well received. Later in life he made an expedition to Canada, which proved disastrous, and he returned home to die in poor circumstances at Greenock. Of his many works those which have made most impression are *The Annals of the Parish* (1821), *The Provost*, *Sir Andrew G. Wyllie*, and *The Entail* (1823).

Galton, SIR FRANCIS. F.R.S., was born at Duddeston in 1822, and was admitted at King Edward's School, Birmingham, from which he went to the Birmingham Hospital, and later to King's College, London, to study medicine, finally graduating at King's College, Cambridge, in 1844. In 1846 he went to North Africa, and to South Africa in 1850, embodying his experiences in *Explorer in Tropical South Africa*, and in the useful manual, *Art of Travel*. Latterly he has given his attention to anthropology, and has written upon *Hereditary Genius*, *Natural Inheritance*, and many kindred subjects.

Galvani, LUIGI (1737-1798), an Italian physiologist, was born at Bologna, where he became Professor of Anatomy in 1762, and lectured with much success, and gained a reputation in comparative anatomy. In 1791 he wrote his celebrated *Commentary on the Power of Electricity in Muscular Movement*. He was afterwards removed from his post for political reasons, but was subsequently reinstated. In 1840-42 a quarto edition of his works was published by the Academy of Sciences at Bologna, and some manuscripts have recently been discovered. A statue was erected to him at Bologna in 1879.

Galvanised Iron consists of wrought iron, the surface of which is coated with an alloy of zinc and iron. No definite electrical process is undergone to effect the deposition of the zinc, though the name almost implies such a process. The iron is well cleaned and freed from all rust by immersion in dilute acid, and is then dipped into a bath of zinc kept melted under sal-ammoniac (ammonium chloride, NH_4Cl). The advantages gained by galvanising iron are that in this state the metal does not so readily corrode and rust by exposure to the atmosphere and moisture. It is hence much used for manufacture of culinary and kitchen articles, for wire, roofing, and many other purposes, for which ordinary iron, owing to the ease with which it oxidises and rusts, would be unsuitable.

Galvanism is the old name given to the study of current electricity, in honour of Galvani, who was the first to investigate the effects of electric currents. Nevertheless, he formed certain misconceptions as to the cause of the currents produced

in his experiments, and the correct explanations were due to Volta. On this account the term *voltaic* electricity is now much more in use to express the same idea.

Galvanometer is an instrument of much importance in current electricity, designed primarily to measure the strength of electric currents. In the article on ELECTRICITY it was explained that the strength of current was proportional to the electromotive force or available pressure in the circuit and inversely proportional to the total resistance of the circuit; that, in fact, the current could be estimated in suitable units by Ohm's law,

$$C = \frac{E}{R}.$$

If E is measured in volts and R in ohms, C

would be estimated in this formula in ampères. An instrument that is to determine the magnitude of C may be put in any part of the circuit, because the strength of the current is the same in all parts. Nevertheless, if the instrument measures the current by some means that require the actual passage of the current through the instrument, it is evident that the resistance of the instrument itself must not be such as to seriously alter the total resistance of the circuit, otherwise the introduction of the instrument alters the quantity that we require to measure. Most galvanometers are of this nature; the electric current is made to pass through the instrument, and by reason of certain quantitative laws that regulate the effects of currents, observation of its effects may be interpreted so as to give us the current strength. Now it happens that with all the ordinary types of galvanometer sensitiveness is only obtained at the expense of extra resistance; that is to say, an instrument may be made more sensitive, so as to be capable of measuring smaller currents with accuracy, but only by making its resistance greater. The resistance itself is not desired, but it is a necessary consequence of the greater sensitiveness introduced. It follows, therefore, that the introduction of a sensitive galvanometer into a low-resistance circuit is useless; for the high resistance thus introduced entirely spoils the current to be estimated. It usually happens that the sensitive galvanometer is not required in such cases, for the currents in low-resistance circuits are sufficiently large to be measurable by less sensitive instruments. On the other hand, in the case of a high-resistance circuit containing, let us say, 120,000 ohms resistance, the introduction of a galvanometer of 2,000 ohms resistance brings up the total resistance to 122,000 ohms, which is not so different proportionally to the original state of things. The current is altered but to a very slight extent, and the instrument is likely to be of sufficient sensitiveness to measure the small current existent in this circuit.

The principle of the galvanometer is that of the action of an electric current upon a magnetic or electro-magnetic needle. If a needle be suspended by a fine silk fibre, or supported on a sharp point, it will be drawn into the plane of the magnetic meridian, and will point to the magnetic north and south. If a wire be brought near it through which

an electric current is passing, the needle will tend to arrange itself at right angles to the wire. The tendency is to some extent hidden by the earth's controlling force, which still pulls it in the direction of north and south. There is thus a definite deflection produced, representing the direction of the resultant force acting at each end of the needle; the resultant force is due (1) to the controlling force of the earth's magnetism; (2) to the deflecting force due to the electric current. On the relation between these two forces depends the deflection produced. The deflecting force is increased by placing the wire as near as possible to the needle and by increasing its length. This latter is most conveniently effected by winding it round a bobbin in many coils. The effect produced by 40 coils is approximately equal to 40 times the effect produced by a single coil; but the resistance of the 40 coils is also increased 40 times. It is useless to increase the number of coils indefinitely, because they must occupy space, and after a time they become too distant from the needle to be at all efficient. More coils can be wrapped in the same space by using finer wire, but this also means increasing the resistance of the instrument. Finally the deflecting force may be made to have a maximum effect on the needle by adjusting either the coil or the needle so that the force is at right angles to the needle. With regard to the controlling force, it is desirable that this should be small if the instrument is to be highly sensitive. Using a weaker magnet certainly diminishes the controlling force, but it also diminishes the deflecting force in the same proportion. Hence a weak needle is just as sensitive as a strong one, other things being equal. But if, instead of using a weak magnet, a pair of equally magnetised needles be fixed parallel to each other at about a distance of one inch apart, with opposite poles adjacent, the pair will, as a whole, have a very small controlling force acting on it, but the deflecting force due to the coils will be increased. Such a combination is called an *astatic pair*, and is much used in delicate galvanometers. The controlling force on a needle may also be diminished by the use of a *controlling magnet* that may be fixed on a vertical axis above the instrument, and placed near or remote at pleasure, thus varying the sensibility through a considerable range.

The following are the chief types of galvanometer known to electricians:—

Tangent Galvanometer, in which the deflecting force is arranged always at right-angles to the controlling force, which must be constant in magnitude. The tangent (q.v.) of the actual deflection produced is here a measure of the current strength. The conditions required are obtained by using a large circular coil placed parallel to the magnetic meridian, and by suspending a *small* needle in the centre-line of the coil. Such an instrument is not very sensitive, because of the necessarily great distance of the coil from the needle.

Sine Galvanometer, in which the deflecting force is arranged always at a constant angle to the needle, and in which the controlling force is constant in magnitude and direction. The current is measured

by the sine (q.v.) of the angle of deflection. The instrument is not required to satisfy any further conditions, and all galvanometers may on this account be used on the sine principle. The instrument is most sensitive when the "constant angle" required is a right-angle, but by choosing this angle anything between 90° and 0° , a great range of sensitiveness may be obtained.

Astatic Galvanometer means, as a rule, a fairly high-resistance galvanometer with an astatic needle. A convenient form was designed by Nobili.

Mirror Galvanometer is a sensitive high-resistance galvanometer first devised by Lord Kelvin for cable purposes, intended for the measurement of very small currents. Minute deflections are recorded by fixing a small mirror to the needle or its suspension; this mirror may be made to reflect a beam of light on to a graduated scale, and any small motion of the mirror gives a magnified motion of the spot of light on the scale.

Differential Galvanometer is one in which there are two equal coils wound round the bobbins so as to have the same magnetic effect. Equal and opposite currents flowing through the coils will, therefore, produce no effect on the needle, and the instrument is thus capable of determining the equality of two currents and indirectly the equality of two resistances also.

Ballistic Galvanometer is one that measures the quantity of electricity that is suddenly discharged through the instrument. This is estimated by the magnitude of the first throw of the needle in much the same way as the momentum of a bullet is measured by means of the first swing of the *ballistic pendulum* (q.v.), into which it is projected. [ELECTRICITY. Also see vol. iv., plate facing p. 321.]

Galvanoscope is an instrument for the mere indication of the presence of electric currents; its principle is usually the same as that of the galvanometer.

Galveston, a seaport and the largest town of Texas, United States of America, is situated on a low sandy island at the mouth of Galveston Bay, about two miles from the mainland. The island is about 30 miles long, with an average width of $2\frac{1}{2}$ miles. The bay is about 35 miles in length from the city to the mouth of Trinity river, and is from 12 to 18 miles broad. There is a good harbour, protected by jetties, and a service of steamers to New Orleans, New York, Havana, and Liverpool. There are a Catholic university and cathedral, many schools, a medical college, and hospitals. The principal export is cotton. Among the industries are founding and machine-making.

Galway, a maritime county in the west of Ireland, in the province of Connaught, having the Atlantic Ocean on the W., Clare and Galway Bay on the S., Mayo and Rosecommon on the N., and Roscommon, King's County, and Tipperary on the E. It is the largest county after Cork, and contains over a million and a half acres. Lough Corrib, which covers 30,000 acres and has many islands, divides the county into an eastern part, which is for the most part level, with much bog, but having

in the N. fertile land and in the S. the Slieve-banghty mountains, and a western part—sometimes called Connemara—which is mountainous and wild. There are many harbours on the coast, used chiefly by fishermen, who with the agricultural population make up the inhabitants. In the west are the mountains of Binabola or the Twelve Pins, which reach 2,400 feet in height. The Shannon is the only large river, others being the Suck, the Claregalway, and the Ballynattrinch. Of the lakes, which west of Lough Corrib are about 130 in number, Lough Rea is noted for its scenery. Other tracts—called “turloughs”—are underwater for part of the year. The county is rich in minerals, and there are mineral springs. Among the antiquities of the county are cromlechs, seven round towers, and many ruins of monastic buildings, the chief of these being that of Knockmoy, with its frescoes illustrating ancient Irish costumes. There are also Anglo-Norman remains. The town of Galway, capital and a county in itself, is on the N. shore of Galway Bay, on the river Corrib, which unites Lough Corrib with the Atlantic. It returns one member. There are some curious old buildings and a notable cruciform church. Brewing, tanning, distilling, and paper-making are carried on, and there is a good salmon fishery. Galway Bay, between Galway and Clare, has a length of 30 miles and an average width of 10 miles, and its entrance is protected by the three isles of Aran—Inishmore, Inishmaan, and Inisheer.

Gama, VASCO DA (c. 1460–1525), a Portuguese discoverer, was born at a small seaport in the province of Alemtejo. In his youth Prince Henry the Navigator died, and when Manoel succeeded João II. on the throne, Vasco da Gama, who had made himself a name in the wars with Castile, was sent in 1497 with four ships upon a voyage of discovery, one special object being to discover the country of Prester John. With difficulty he rounded the Cape, and then, under the guidance of an Indian pilot, crossed the Indian Ocean, and arrived at Calicut. Owing to the jealousy of traders, he had to fight his way out of harbour, and returned to be ennobled and treated with much favour. In 1502 he was given command of a squadron sent out to avenge some massacred traders, who had been left by Cabral to found a trading colony at Calicut, and on this occasion he bombarded Calicut and committed great acts of cruelty. The king gave him solid proofs of his gratitude, and for a time Da Gama lived in retirement, but in 1525 João III. made him Viceroy of India. He went to Goa, and the same year died at Cochin. He is celebrated in the *Lusiad* of Camoens, and Correa's *Three Voyages of Vasco da Gama* have been translated for the Hakluyt Society.

Gamaliel is a Hebrew name, often met with, but more particularly bestowed upon three noted Rabbis, of whom the first is that Gamaliel at whose feet St. Paul sat. He was noted for his tolerance towards the Christians and other Gentiles. He was thought to have become Christian, but this is improbable. GAMALIEL OF JABNEH was the grandson of the above-mentioned, and after the fall of

Jerusalem was the head of the nation. Both of these were among the seven great Rabbis of the Talmud.

Gambetta, LÉON MICHEL (1838–1882), was the son of a small tradesman at Cahors, and was called to the Paris bar in 1859. He first attracted general notice by his attack on the Empire as counsel for the defence in the Delescluze trial in 1868. In 1869 he became deputy for Marseilles. After the fall of the Empire he was appointed Minister of the Interior, and was in Paris during part of the siege, but escaped in a balloon, and as War Minister and practically Dictator was the heart and soul of the resistance to the Germans. He was bitterly opposed to any armistice. In 1871 he had difficulties with the Government, and retired to Spain, and had no part in the troubles of the Commune. On his return he was elected for several departments, but chose to sit for the Bouches du Rhône. In 1875 he was opposed to M. Thiers, but his views in a measure triumphed in 1875, when a Republican form of Government was decreed. In 1877 his firmness saved the country from a possible civil war on behalf of monarchy, and though condemned to three months' imprisonment for an alleged threat against the President, he was not imprisoned, and MacMahon resigned. Gambetta would not take office, because of the refusal to adopt the *scrutin de liste*, but from 1878–80 he was President of the Chamber, and in 1881–82 he occupied the post of Prime Minister. He resigned, still over the question of the *scrutin de liste*, which the majority would not adopt, and thenceforward kept in the background in politics. He was killed by the accidental discharge of a pistol at Ville d'Avray, near Paris, on Dec. 21, 1882. His speeches have been published, as has also a life.

Gambia, a river of West Africa, rises in a high land 240 miles inland, which contains the sources of the Senegal and some tributaries of the Niger. The mouth of the Gambia is in lat. 13° 50' N. It is thought to have a course of 1,400 miles, and the estuary is 27 miles across in places, though at the mouth only two. It is navigable for steamers for some distance, and for boats to the falls of Barraconda, three hundred miles from the mouth, and for a long distance above the falls. Below Barraconda the country on both sides is liable to be flooded, and the river leaves behind a fertilising deposit. The British colony of Gambia—which is now independent of Sierra Leone, and provides a Houssa force for its own defence—lies mostly on the left bank of the river, and has for its capital Bathurst, which is on St. Mary's Island at the mouth of the river—an island of sand, about 15 miles long, by one broad, and separated from the mainland by a creek and swamp. Opposite the island is British Combo, a territory of six miles by three; and about 200 miles up the river is McCarthy's Island, which contains a trading-town called Georgetown. There is some weaving, and oil and brickmaking; and the chief exports, besides the ground-nut, are hides, cotton, rice, kola-nut, and indiarubber. There is telegraphic communication with Enrope, and Liverpool steamers call fortnightly.

Gambier. [CATECHU.]

Gambier, JAMES GAMBIER, first Lord, second son of James Gambier, Lieutenant-Governor of the Bahamas, was born in the Bahamas in 1756, and, as a commander, was captured in the *Thunder*, bomb, by the French in 1778. In the same year he was posted, and as captain of the *Raleigh*, 32, served ashore at the reduction of Charleston in 1780. He commanded the *Defence*, 74, on the Glorious First of June, 1794, and became a rear-admiral in 1795, a vice-admiral in 1799, an admiral in 1805, and Admiral of the Fleet in 1830. He was made Governor of, and commander-in-chief at, Newfoundland in 1802. He effected the seizure of the Danish fleet in 1807, and was for this service created a baron of the United Kingdom; and he was commander-in-chief in the Channel when, in 1809, Lord Cochrane made his splendid attack upon the French ships in Basque Road. He relinquished this post in 1811. In 1814 he was one of the commissioners appointed to treat at Ghent for peace with the United States. In 1815 he was made a G.C.B., and for many years he had a seat at the Board of Admiralty. He died in 1833.

Gambling, or GAMING, the playing any game of chance, such as cards, dice, etc., for money or money's worth. Gaming houses, together with unlicensed playhouses and disorderly houses, are either at common law or by statute public nuisances, and may upon indictment be suppressed and their keepers fined, and in some cases imprisoned with hard labour. Against gaming-houses in particular assiduous care has been bestowed by the Legislature; and by statutes passed in the reigns of Henry VIII., Anne, and George II., the keeping of common houses for unlawful games and a variety of specified games was prohibited under heavy penalties; and by several statutes of the present reign further provisions have been made regarding the offence now under consideration, and in particular for the punishment of those who keep or frequent *common gaming-houses*, and for suppressing such houses. These statutes provide that the owner or keeper of any common gambling-house, and every person having the care or management thereof, and every banker, croupier, and other person in any manner conducting the business of any such house, shall on conviction by the oath of one witness before two justices of the peace be liable, in addition to penalties prescribed by 33 Henry VIII., c. 9, to pay such penalty, not exceeding £500, as shall be adjudged by such justices or, in their discretion, to be committed to the house of correction, with or without hard labour, for not more than twelve months; but any witness who shall make true discovery to the best of his knowledge shall be entitled to a certificate of his having done so, and shall thereupon be freed from all criminal proceedings, forfeitures, and disabilities for anything he has himself done, and, on the other hand, anyone found in a suspected gaming-house may be required to be examined and to give evidence, and shall not be excused on the ground that such evidence will tend to criminate himself. One of the above statutes provides that anyone who by fraud, unlawful device, or ill-practice shall win

any money or valuable thing shall be deemed guilty of obtaining it by false pretence, and be punished accordingly; also that all contracts, whether verbal or written, by way of gaming or wagering, shall be null and void, and that no action shall be brought to recover any money or valuable thing alleged to be won on any wager or which was deposited with any person to abide the event; but this enactment is not to apply to any subscription towards a plate or prize at any "lawful" game, sport, pastime, or exercise. Finally by 36 and 37 Victoria, c. 38, every person playing or betting by way of wagering or gaming at any game, or pretended game of chance, *in any street, road, highway, or other open and public place*, or in any open place to which the public have access, is to be deemed a *rogue and vagabond*, and be liable to be convicted and punished accordingly, or, at the discretion of the justices, fined in a penalty not exceeding 40s. for the first offence, or £5 for any subsequent one. [LOTTERIES.]

Gamboge, a gum-resin obtained from the bark of *Garcinia Hanburii*, *G. Morella*, and allied species of that genus of the order Guttiferae or Clusiaceae, trees, with opposite, glossy, leathery leaves, natives of Siam, Cambodia, Cochin China, Ceylon, and Southern India. Gamboge occurs in "pipes" or "rolls" and in lumps. It is of a dirty orange externally, hard, brittle, with a conchoidal fracture, and odourless. It contains 20 to 25 per cent. of gum, with 70 to 75 per cent. of the resin gambogic acid. Britain imports from 10 to 30 tons annually, mainly from Bangkok and Saigon. It is used as a pigment, for colouring varnishes, and as a purgative.

Game and Game Laws. The right or privilege of hunting, taking, and killing certain animals *ferae naturae* in exclusion of other persons has been long recognised in Great Britain, and there formerly existed a system of a severe character under which none were permitted to take or sell game unless duly *qualified* in respect of property, and the ordinary qualification originally was the ownership of lands or tenements in possession or an estate of inheritance of the yearly value of £100 or for life, or 99 years or upwards of the yearly value of £150—a qualification imposed chiefly for the prevention of idleness and dissipation in the lower classes—and with the same view, and also for the benefit of the revenue, it was subsequently made necessary for sportsmen to take out a yearly game certificate attesting the payment by them of a certain duty. The principle of requiring any personal property qualification has long since been abandoned, and statute 1 and 2 William IV., c. 32, has provided that the right to kill game upon any land shall be vested *ratione soli* in the owners of such land (mere occupiers for short terms excepted) or in any person having the grant or permission of such owners for the purpose; but a game certificate is still required, and the above-named statute and the statute 23 and 24 Victoria, c. 90 (the principle Game Acts now in force), require all persons killing, taking, or pursuing game to take out a yearly *exercise license*, which is substituted for the former game certificate, and these statutes also require persons who, having no such licence, *deat*

in game to take out an excise licence for this latter purpose. The revenue from gun-licences, dog-licences, licences to kill game, and certificates to deal in game, has now been granted to the County Councils under the "Local Government Act, 1888." The above statutes also contain many penal provisions intended for the better preservation of game and for the protection of the landowner from *poaching*, whether by night or otherwise, and generally against unlawful trespasses in sporting. Under these acts, game is defined to include hares, pheasants, partridges, grouse, heath or moor game, black game, and bustards, though some parts of the Acts are also directed to deer, woodcocks, snipes, quails, landrails, and rabbits. As to hares, there are also some special provisions, one being that in the absence of special agreement to the contrary, any occupier of enclosed lands or any owner thereof with the right of killing game therein, may kill hares on such land without an excise licence, and that such licence need not in any case be obtained by one who pursues hares with greyhounds, beagles, or other hounds. By the Ground Game Act, the right of the occupier to kill ground game, such as hares and rabbits, concurrently with the landowner or other person entitled under him to such game, is made a right inseparable from his occupation, and he cannot contract himself out of his right under the Act, and the occupier need not take out any licence. The law regulating the pursuit of animals in the chase has made certain distinctions. Thus if one starts any such animal on his own ground, and follows it into another's, and kills it there, the property remains in himself; but if, being a trespasser, he starts it on another's land and kills it there, the property belongs to him in whose ground it is killed and this even though the trespasser may have sold the dead game to a third person. Again, if it be started by a stranger in anyone's chase or free warren and hunted into another liberty, the property continues in the owner of the chase or warren. These distinctions show that in general the property is acquired by the seizure or occupancy, though that cannot prevail against the better claim of him in whose grounds the animal is both killed and started. In the United States, subject to the laws against trespass, game can be freely captured or killed; but there are some states which prohibit this during certain seasons in order to encourage the breed. [FOREST LAW.]

Gamerghu, a numerous people of South Bornu, Central Soudan, where they occupy the Ujeh district watered by the Komadugu affluent of Lake Chad. They are a branch of the Ur-Wandalas, and differ in every respect from the Kanuri or ruling people of Bornu. The Gamerghu are muscular, well-made, with deep brown complexion and somewhat regular features, which can scarcely be called negro. Most of them are still pagans, the Mohammedan religion of their Kanuri rulers having penetrated only into the settlements along the main trade routes. Their chief town is Maidugheri, a place situated on the Komadugu, with a population of 15,000. (Rohlf's *Quer Durch Afrika*, Leipzig, 1875, vol. ii.)

Gametes, a sexual reproductive cell in plants, especially among the lower plants in which conjugation occurs. If ciliated, it is termed a *planogametes*; if not, an *aplanogametes*.

Gamopetalæ, or COROLLIFLORÆ, a sub-class of Dicotyledones (q.v.), in many respects more highly organised than either the Thalamifloræ (q.v.) or Calycifloræ (q.v.). It is characterised by complete and perfect flowers having usually five united sepals, five united petals, five epipetalous stamens, and two united carpels, but exceptional apetalous, polypetalous, and unisexual cases occur. The sub-class is divided into two series, the *Hypogynæ*, with a superior ovary, including Labiata, Scrophulariaceæ, Convolvulaceæ, Solanaceæ, Boraginaceæ, Gentianaceæ, Oleaceæ, and Ericaceæ; and the *Epigynæ*, with an inferior ovary, including the Campanulaceæ, Compositæ (q.v.), Rubiaceæ, and Caprifoliaceæ.

Gamut or GAMMUT (from the Greek letter Gamma), the name given to Guido's system of musical notation. In modern music the word is used of the scale of wind instruments.

Gando, an African kingdom of the Western Soudan, on the Niger from Birni in the N. to Idda in the S., dependent upon Sokoto, and estimated to contain 81,500 square miles. The population of the Houssa and Fûlah races are mostly Mohammedans. The chief town, Gando, is on the Sokoto, a tributary of the Niger, and not far from the town of Sokoto. The principal trading town is Egga.

Ganesa, a Brahmanic god, son of Siva, the god of prudence, whose name is invoked at the beginning of an undertaking, and is to be met with at the head of books and documents. His figure in the temples has an elephant's head, and is riding on a rat.

Ganga. [SAND-GROUSE.]

Ganges, the sacred river of the Hindoos, the bathing in whose waters washes away all sin, rises in Gahrwal (q.v.), from an ice-cave a few miles above the sacred temple of Gangotri, at a height of 13,800 feet. In its early course it is called Bhazirathi, and does not receive the name of Ganges till after flowing nearly 200 miles and receiving the waters of two tributaries. It passes through the Himalayas at Sukhi, and flows S.W. to Hardwar, and then generally S.E. of Allahabad, where it receives the Jumna, and on past Benares through Behar, being joined by three more tributaries, and then flows S., beginning to form its delta at 220 miles from the mouth. The main stream, which receives the Brahmaputra, is to the E., and the Hooghly, on which stands Calcutta, to the W. The upper part of the Delta is fertile, but the lower part is swampy, and numerous canals connect the branches of the river. The whole course is 1,557 miles, and the river drains 390,000 miles of country lying between the Himalayas, Burmah, and the Vindhya Hills. The river is perennial, and enriches the land with the deposit of its inundations, and is navigable for the greater part of its course. Hence perhaps its sacredness.

Ganglion, a sac or cyst formed in connection with a tendon. This condition is most commonly met with at the back of the wrist. Ganglion does not give rise to pain, but the discomfort and unsightliness caused by the swelling usually lead the sufferer from this condition to resort to surgical treatment. A puncture and subsequent pressure usually speedily effect a cure.

Ganglion Cell is the term applied to the nerve-cells which are found in the grey matter of the spinal cord, in the brain, and other nervous tissues. [NERVOUS SYSTEM.]

Gangrene, or MORTIFICATION, is the death of a portion of the animal body. *Gangrene* should be distinguished from *ulceration*. In the former a large portion of tissue and in the latter very minute portions are affected. Thus, gangrene has been termed *molar death*, and mortification *molecular death* of tissue. In gangrene the part of the body involved becomes cold, pale, and shrivelled; there is loss of sensation and general impairment of function. Sometimes the part may be from the outset swollen, sodden, and discoloured. The living tissues which surround the affected part become, after a while, clearly marked off from it by the formation of what is called the line of demarcation. The gangrenous portion or slough is thus ultimately separated and cast off from the body, and when this has occurred healing takes place with the formation of scar tissue. Gangrene is due either to direct destruction of tissue by external agents or to a cutting off of the supply of blood to the part affected; thus, as the result of a burn or from exposure to extreme cold [FROST-BITE], a slough is formed. A severe injury is apt to be followed by death of the tissues involved (traumatic gangrene). When the injured part or wounded surface becomes the seat of septic inflammation, the condition of things is much aggravated, and in such instances the terms *phagedæna* or *hospital gangrene* are used to describe the disease. *Norna* and *cancerum oris* are varieties of phagedæna, which occur in poorly nourished children. In *senile gangrene* the rigid condition of the arteries produced by the atheromatous degeneration, commonly associated with advancing years, interferes with the normal supply of blood, and death of the affected tissues occurs. Lastly, the bed sores which occur in cases of prolonged illness and the curious condition known as ergotism, may be alluded to as varieties of gangrene. Treatment of gangrene consists in maintaining the strength of the patient and carefully protecting the diseased structures from cold, injury, and septic contamination. The question of removing the dead portions of tissue by amputation is, of course, a matter for the judgment of the surgeon.

Gangue. This term is applied to the portion of the rock or earthy material which occurs mixed with metallic ores. The nature of the gangue hence varies with the nature of the rock surrounding the metalliferous lodes or veins, and may consist of felspar, fluorspar, granite, quartz, limestone, etc. The gangue is sometimes useful in the

smelting of the metal, owing to its acting as a "flux," but a great quantity always detracts from the value of the ore. The terms *reinstuff* and *matrix* are also applied with the same signification.

Ganguellas, the collective name of a widespread Bantu people of south-west Africa, whose domain extends from Bihé in Benguela eastwards to the Chobe head-stream of the Zambesi. They comprise five main groups, the Ambuellas, Luimbés, Chibokwes, Luvalés, and Ba-Lundas, all speaking closely-related dialects of a distinct Bantu idiom intermediate between the Umbundu of Angola and the Herero of Damaraland. The term *Ganguella*, meaning "Stammerers," has been applied to them by the A-Bunda people of Angola because of their unintelligible speech, just as the Germans are called *Niemce*, the "Speechless," by their Slav neighbours. The Lundas, most numerous of all the Ganguellas, constitute a powerful nation about the headwaters of the Liba affluent of the Zambesi. They have long had indirect relations with the Portuguese through the Bihé traders, and most of the beeswax exported from Angola comes from their country. The Lundas are amongst the few African peoples who respect their women, some of whom even rise to the rank of queens. (Serpa Pinto *Comment j'ai traversé l'Afrique*, Paris, 1881.)

Ganjam, a district of India lying along the Bay of Bengal, in the N.E. of the Madras Residency. The town of the same name is 18 miles N.E. of Berhampur, and was once the chief town of the civil district, but it is now decayed, and its place is taken by Berhampur.

Gannet, any bird of the genus *Sula*, with eight species, belonging to the Pelican family, and universally distributed in cold and temperate regions. The face and neck are naked; the bill is straight and strong, and longer than the head; the four toes are long and united by a membrane. The gannets are good swimmers and divers, very powerful on the wing, living on fish, and nesting socially on rocky cliffs and islands. The best-known species is the Common Gannet or Solan Goose (*S. bassana*), a British bird, breeding on Ailsa Craig, the Bass Rock (whence it derives its specific name). Lundy, St. Kilda, and on the Skelligs off the coast of Kerry. The nests are rude structures of seaweed, and each contains but a single white egg. The adult male is a little under three feet long, and has the naked skin of the face blue, head and neck buff, primaries black, and the rest of the plumage white. The young during their first year are black, marked with lines and dots of white, so that the chief resemblance between young and adult birds is in the long, straight bill. Large numbers of the young birds are taken every year at the Bass for the sake of their down. The flesh of old birds is rank, but that of the young is valued for food, and both young and old birds yield oil. The eggs are considered a delicacy. *S. variegata*, from the Southern hemisphere, is one of the birds that have formed the guano deposits in the Pacific islands. [BOOBY.]

Gannister, a hard, fine-grained sandstone, occurring in the Lower Coal Measure series. It is

used for road-metal; or, when ground down, in iron- and brass-casting; or, mixed with fire-clay, in making fire-bricks and lining furnaces.

Ganoid Fishes, an order containing only seven recent genera, though to it belonged most of the palæozoic and mesozoic fossil forms. [BOXY PIKE, FISHES, MUD-FISH (*Amia*).]

Ganteaume, HONORÉ, a very distinguished French sailor, was born at La Ciotat in 1755, and commanded the *Trente-et-un Mai* on the Glorious First of June, 1794, and as *chef-de-division* in the *Mont-Blanc*, 74, a squadron which escaped from Toulon in 1795. He was subsequently one of the commanders of the Invasion Flotilla, was captain of the fleet to Vice-Admiral Brueys at the seizure of Malta and at the battle of the Nile, and as rear-admiral, in the *Muiron*, brought back Bonaparte from Egypt. In 1801 he commanded the expeditionary fleet to Egypt, and, in 1802, a division of the expedition to St. Domingo. As vice-admiral he commanded the Brest Fleet in 1804, the Toulon Fleet in 1808, and a still larger Toulon Fleet in 1809. One of the bravest and most capable admirals in the French service, his death, in 1818, was regarded as a national catastrophe.

Ganymede, in Greek mythology, the cup-bearer of Zeus. According to one account, he was the son of King Tros and Callirrhoe, and Zeus, noticing his comeliness, sent the eagle to bear him away to heaven. He figures in the zodiac as Aquarius, and the rape of Ganymede has formed a subject for poet, sculptor, and painter. One of Horace's finest odes mentions the legend. Thorwaldsen has commemorated it, and the flight on the eagle is the subject of a fine picture of the school of Titian at present in the National Gallery, London.

Gapes, a disease which occurs in chickens and other birds. It is caused by the presence of parasitic worms in the trachea or windpipe.

Garanceux. [GARANCINE.]

Garancine is a preparation of madder-root, which was formerly very largely employed in the dyeing industry. It is obtained by the action of (1) dilute, (2) strong, sulphuric acid, upon the root. It possesses about four times the colouring-power of the madder itself, and also gives better colours. A poorer quality obtained from spent madder is known as *garanceux*. Both these, like all other madder extractions or preparations, are now almost entirely superseded by the artificially-prepared *alizarine* (q.v.), which forms the colour-principle of them all.

Garay, JANOS (1812-1853), a Hungarian poet, lived at Pesth. He wrote dramas, an epic poem, an historical poem, made a poetical collection of historical legends, and wrote lyrics. A complete edition of his works and a life of him have been published.

Garcia, MANUEL (1775-1832), a singer and composer, was born at Seville. He first appeared as a tenor at Cadiz and Madrid, and in 1808 sang in Italian opera at Paris. He went also to Italy and to London, and in 1825 travelled with a company

to New York and Mexico. On this expedition he was robbed, and was compelled upon his return to Paris to give singing lessons for a livelihood, as his voice had gone. Two of his pupils were his daughters, Pauline and Maria, better known as Mesdames Viardot-Garcia and Malibran. His best composition was the *Caliph of Bagdad*.

Garcilaso (1540-1616), a Spanish historian, was born at Cuzeo, his father being a Spanish soldier and his mother a princess of the Incas, whence he is sometimes called "Inca." He went to Spain in early manhood, and lived at Cordova. His work *La Florida del Inca* (1605), giving an account of Ferdinand de Soto's conquest, and his *Royal Commentaries* on Peru, were translated into English in 1688 and in 1869.

Garcilaso de la Vega (1503-1536), a Spanish soldier-poet, was born at Toledo. He fought in Charles V.'s army against the French and the Turks, and was mortally wounded at the siege of the castle of Fréjus. He was the first to introduce Italian hendecasyllables into Spain, and was imitated by Lope de Vega, and is often quoted and commended by Cervantes. An edition of his works was published in 1765 at Madrid, and they have been translated into English.

Gard, a department of France on the Mediterranean, and lying W. of the Rhône, and containing 2,245 square miles, is watered by the Rhône and its tributaries, the Gard and the Cèze. In the N.W. is a branch of the Cévennes, and the remainder of the department slopes towards the Rhône and the Mediterranean, the coast being somewhat unhealthy by reason of its marshes and great summer heat. Many olives and chestnuts are grown, and silkworms are reared. Formerly it was noted for its wine, but of late the phylloxera has wrought great havoc among the vines. Coal, iron, lead, marble, salt, and antimony are among the minerals, and there are important iron and steel works. Nîmes is the capital, ten miles to the N.E. of which is the *Pont du Gard*, an aqueduct, one of the most magnificent of Roman remains in France.

Garda, LAGO DI, between Lombardy and Venetia, is the largest of the Italian lakes, being 35 miles long, with an average of 7 broad, and containing 115 square miles. It is more than 200 feet above sea-level, and is almost a thousand feet deep. The rivers Sarca and Ponale flow into it, and the Mincio drains it into the Po. The upper end (Riva) is Austrian and the rest Italian. The district is a favourite health-resort for its fine climate, the neighbourhood of the lake containing many villas. The Alpine spurs in the N. are interspersed with pretty valleys, and the southern slopes grow citron, figs, grapes, myrtles, and mulberries. The principal productions are olives and fish, which are abundant. On a peninsula jutting from the south shore is Sirmione, mentioned by Catullus, with Roman remains.

Gardaia, a town of Algeria, is situated in an oasis of the Sahara, and forms part of the territory claimed by France. It is surrounded by a low wall, and there is a modern French fort. The town lies 82 miles N.W. of Wargla.

Gardenia, a genus of trees and shrubs, belonging to the tribe Cinchoneæ of the order Rubiaceæ, which are natives of tropical Asia and Africa, and of the Cape, and are valued for their fragrant white flowers. *G. florida*, the "Cape Jasmine," has generally double flowers.

Gardening. [HORTICULTURE.]

Gardiner, JAMES (1688-1745), was a British officer born at Carriden in Linlithgowshire. He became an ensign at 14 in a Scottish regiment in the Dutch service, which service he abandoned in 1712 for that of Queen Anne. In 1706 he was wounded at Ramillies, and he fought at the battle of Preston in a Dragoon regiment. In 1704 he was a major in the 1st Inniskillings, becoming lieutenant-colonel of the regiment in 1730. About this time he experienced "conversion," a process which did not destroy his soldierly qualities. In 1743 he became colonel of the 13th Light Dragoons, and in 1745 died bravely at the battle of Prestonpans.

Gardiner, SAMUEL, historian, was born in 1829 in Hampshire, and was educated at Winchester and Christ Church. He then became Professor of Modern History at King's College, London, till in 1885 he was elected Fellow of All Souls'. His historical studies chiefly dealt with the time of James I. and Charles I., and his work is divided into these periods; *James I. to the Disgrace of Coke*, *Prince Charles and the Spanish Marriage Schemes*, *England under the Duke of Buckingham and Charles I.*, *The Personal Government of Charles I.*, and the *Fall of the Monarchy of Charles I.* (only to 1642); all of which were afterwards gathered into ten volumes of *History of England*. He has written other historical works, and collaborated in an *Introduction to English History*, and also edited several works for the Camden Society.

Gardiner, STEPHEN, Bishop (1483-1555), was born at Bury St. Edmunds. He was educated at Trinity Hall, Cambridge, of which society he became a fellow. In 1524 he lectured, and was appointed tutor to the Duke of Norfolk's sons, and introduced to Cardinal Wolsey, to whom he became private secretary. From 1525-1559 he was Master of Trinity Hall. In 1527 he accompanied Wolsey to France, and made the acquaintance of Erasmus. In 1528 he was sent on an embassy to the Pope, and soon went again to Italy on business connected with the royal divorce. In 1529 he was in high favour at court, and was able to intercede for Wolsey, and endeavoured to save the cardinal's colleges at Ipswich and Oxford, being successful, however, only in the case of the latter. In 1531 his services in the matter of the divorce gained him the bishopric of Winchester, and in 1532 he was with Henry at Calais. He has been accused, and with some apparent reason, of double-dealing in the matter of the divorce and in his general ecclesiastical attitude. In 1534 he renounced allegiance to Rome, and wrote a treatise *De Verâ Obedientiâ*, which gained him the odium of orthodox Catholics. His opposition to Cromwell made him suspected at court, but in 1535 he was again in favour, and acting as ambassador to France. In 1538 Bonner

superseded him at Paris, but in 1539 he was ambassador to Germany. He gave offence to Protestants both at home and abroad by promoting the Six Articles. At the accession of Edward VI. Gardiner fell upon evil days, and was for a time in the Fleet. He then retired to Lambeth, but was arraigned upon various charges, and was committed to the Tower. Mary's accession set him free, and he crowned her, and was made Lord Chancellor. He was prominent in the persecutions of her reign.

Gardner, LORD. Two British naval officers of note have borne this title. The first, ALAN GARDNER, born in 1742, was son of Lieutenant-Colonel Gardner, and, before becoming a lieutenant, was present in the glorious battle of Quiberon Bay in 1759. He was made commander in 1762, and captain in 1766. In the *Maidstone*, 28, he signalled himself by the capture of the *Lion*, 40, and in the *Sultan*, 74, he behaved with remarkable bravery in Byron's action off Grenada in 1779, and in Cornwallis's action with M. de Ternay in 1780. In the *Duke*, 98, he took part in Rodney's actions in the West Indies in 1782, and, on April 12, was the first to break the French line. In 1791 he was made a Lord of the Admiralty; in 1793 a rear-admiral; and in 1794 was one of the flag-officers in Howe's victory of June 1st. For this service he was made a baronet, and promoted to be vice-admiral. In 1795 he bore a slight part in Bridport's action, and in 1797, on the occasion of the mutiny in the fleet, distinguished himself not less by his zeal than by his rashness and threatened severity. He became a full admiral in 1799, and in 1800 was created an Irish baron, and in 1806 a baron of the United Kingdom. After having for a brief space commanded the Channel Fleet, he died in 1809. His son and successor, ALAN HYDE, born in 1772, became a captain in 1790, a rear-admiral in 1808, and a vice-admiral in 1813. In 1796 he secured the surrender of the Dutch possessions in Ceylon; in 1805 he commanded the *Hero*, 74, in Calder's action, and later in the same year he assisted in Strachan's victory. After his promotion to flag-rank he commanded a squadron that observed the Scheldt and Texel. His death occurred in 1815.

Garfield, JAMES ABRAM (1821-1881), President of the United States of America, was born in Ohio, his father being of an old Puritan family, and his mother of Huguenot descent. His father died, and his mother was left in poor circumstances. The boy worked on farms and the Erie canal-boats in summer, and went to school and afterwards to College in winter. He became, in 1857, President of Hiram College, and in 1859 was elected to the State Senate; and when the War of Secession broke out had command of the 42nd Ohio Volunteers. In 1862 as brigadier-general he won the battle of Middle Creek, and in 1863 was made major-general. He sat in Congress till 1880, in which year he became a United States senator and Republican candidate for the Presidency, and was elected. His efforts in the direction of Civil Service reform gave offence to many, and on the 2nd of July he was shot by a half-lunatic office-seeker. He died September 19.

Garfish, any fish of the Teleostean genus *Belone*, with about fifty species from tropical and temperate seas. The body is greatly elongated, and the jaws prolonged into a kind of beak, with widely-set teeth; the dorsal fin is opposite the anal. The jaws in the young fish are of normal shape. *B. vulgaris*, a fairly common British fish, is about two feet in length. The flesh is well-flavoured, but some persons are prejudiced against it, because the bones, like those of the rest of the genus, are green in colour.

Garganey. [TEAL.]

Gargle, a preparation intended for application in diseased conditions of throat and tonsils. The active principle in a gargle is usually either some astringent substance, such as alum or tannic acid, or a mild antiseptic (Condy's fluid, etc.).

Gargoyle, in Gothic architecture, a projecting spout to carry away the water from the gutter surrounding a roof. They are usually carved into figures of angels, men, human faces, or animals, and are often very grotesque. The water issues either from the mouth of the figure or from a leaden spout above or beneath it.

Garhwal, a native state of the North-West Provinces of India, bordering on Thibet, and having an area of 4,180 square miles. There is also a British district adjoining, 5,500 square miles in area, and having mountain ranges of over 25,000 feet in height. The Jumna and the Ganges rise in the native state, and in the district the Bhagarathi joins with a tributary to form the Ganges. Gangotri [GANGES] attracts many pilgrims.

Garhwâli, the natives of British and Independent Garhwâl, West Thibet, who are of Thibetan (Mongolic) stock, but Aryan (Caucasic) speech, now speaking Neo-Sanskritic dialects closely related to Kashmiri. Here are also the Rongbo, and north of them the Kohli, Kakka, Gakar, Avan, and Janju peoples, all of mixed Indo-Thibetan stock, in which the Hindu element largely prevails. The native Rajputs, collectively known as Rhasiya, have lost caste by mixture with non-Aryan populations. The Avans (Awans) are supposed by some ethnologists to be descended of the Yavana—that is, Ionians or Greeks, settled in this region at the time of the Macedonian invasion.

Garibaldi, GIUSEPPE (1807–1882), one of the apostles and active instruments of Italian freedom, was born at Nice. He became a sailor, and in his twenty-first year was in command of a merchant brig. At Marseilles he met Mazzini, who fired him with his own enthusiasm, and induced him to join the abortive Genoese revolution of 1833. For his share in this, Garibaldi was condemned to death, but escaped to Brazil, where he joined the revolutionists in Rio Grande, and did much service as a guerilla leader and privateer. He was made prisoner, and (being separated from his unfaithful wife) became associated with a devoted Creole, Anita, who till her death was the faithful companion of his wanderings. He aided, in 1842, the Montevideans

against the Dictator of Buenos Ayres. The advent of Pius IX., with all its hopes, in 1847, found him in Italy, but he was coolly received by the Pope, and by Charles Albert of Sardinia. He fought against the Austrians, however, in S. Tyrol, and in 1849 joined the revolutionary government at Rome, and drove out the French and Neapolitans, but he defended it in vain against a siege, and was pursued to the Adriatic, Anita dying in the flight. Being banished, he went to New York, worked in a soap factory on Staten Island, and took to the sea again. In 1854 he returned to Italy, and farmed on the isle of Caprera. In 1859 he was summoned by Cavour to Turin, and had a great part assigned to him in the War of Liberation. He was the heart and soul of the expedition against the Neapolitan kingdom, which put Victor Emanuel on the Italian throne, but the renunciation of Rome and the cession of Savoy and Nice disgusted him, and he retired to Caprera. In 1862 he undertook an expedition against Rome, but was checked by the Italian troops at the battle of Aspromonte, where he was badly wounded in the foot. Soon after this he visited England, but though received with much popular applause, he failed in the object of the visit—to get England to take up the cause of Denmark against Prussia. In 1868 he made his ill-advised attempt upon Rome, and was defeated at Mentana by French troops. The rest of his life was passed in comparative retirement, save when in 1870 he hastened to put his sword and life at the disposal of the French republic, and commanded the irregular forces of the Vosges. He was elected deputy to the French National Assembly in 1871, but was refused admission as being a foreigner. For the latter part of his life Garibaldi possessed the isle of Caprera.

Garlic (*Allium sativum*), a bulbous perennial plant belonging to the order Liliaceæ, and probably native to the south of Europe. Its bulb-scales are membranous and 10 to 12 in number, each having a “clove” or small bulb in its axil capable of independent growth. The leaves are linear and slightly keeled: the spathe is deciduous: the globose umbel bears bulbils among its flower-stalks, and the perianth-leaves are white. The whole plant, and especially the bulb, has an acrid taste and a strong smell of allyl sulphide ($C_3H_5)_2S$. It has been used for food from the earliest times in Egypt (Numbers xi. 5), in Greece and Italy, and was considered valuable medicinally. The name is popularly applied to several wild species of *Allium*, and to the cruciferous *Erysimum Alliaria*, which has the same smell and taste.

Garlic, OIL OF. A brown oil which is obtained when the leaves or other parts of garlic are distilled with steam. It also occurs in many allied plants, and some *cruciferae*. If purified by redistillation, it is obtained as a pale yellow liquid, with a peculiar and disagreeable garlic-like odour, which boils at 140° C. It may be artificially produced, and its syntheses, as well as its analysis and reactions, show that it consists of *sulphide of allyl*, and must be represented by the formula $(C_3H_5)_2S$.

Garnet, from the Latin *granatum*, the pomegranate, the seeds of which some granular varieties resemble, is the general name for a group of isomorphous silicates, crystallising in rhombic dodecahedra or icositetrahedra belonging to the Cubic system. They have the general chemical formula $3R^{ii}O, R^{iv}_2O_3, 3SiO_2$, in which R^{ii} is calcium, magnesium, iron and manganese, and R^{iv} is aluminium, iron, and chromium. The chief varieties may be classified as follows:—(1) lime-alumina garnet, including the olive-green *grossularite* and the brown or yellow *cinnamon-stone* or *essonite* of Ceylon; (2) magnesia-lime-iron-alumina garnet, including the blood-red or dark crimson *pyrope* or *Bohemian garnet* found in serpentine and sometimes cut as a *carbuncle* (q.v.); (3) iron-alumina garnet, brownish-red to crimson and amethystine-purple, including the common and often large garnets in mica-schists and gneiss and the precious garnet or *almandine*; (4) lime-iron garnet including *melanite*, a black form found in volcanic rocks, and *aploite*, a brown or greenish form; (5) manganese-alumina garnet or *spessartite*, a brownish-red, which occurs in the Belgian “cotichules” or hone-stones; and (6) lime-chromium garnet, the emerald-green *Uvarovite* or *uvarovite* of the Urals. In hardness garnets range from 6.5 to 7.5; in specific gravity from 3.15 to 4.3. The streak is always white or whitish, and the fracture sub-conchoidal. They vary from considerable transparency to opacity, and from a truly vitreous to a resinous lustre.

Garnett, HENRY (1555–1606), an English Jesuit, was born at Heanor in Derbyshire. He was a scholar of Winchester College, and, becoming a Catholic, came to London, where he studied law and corrected the press for a law printer. He then went to Spain and Italy, and became a Jesuit in 1575. In 1587 he was sent as missionary to England, a position for which his gentle and retiring nature little fitted him. After the Gunpowder Plot a letter found upon Guy Fawkes drew suspicion upon Garnett, and he was for a time hidden with another priest at Hindlip Hall. Forced at last to yield through want of air and movement, he was committed to the Tower. His trial came off in 1606, the judge being Chief Justice Popham, who had known him in former days, and Coke being the prosecutor. He was condemned and executed.

Garnett, RICHARD (1789–1853), an English philologist, was born at Otley in Yorkshire, and was educated at the grammar school there, and learnt, besides French, Italian and German. In 1811 he became assistant-master in a school at Southwell, and learnt Greek, Latin, Divinity, and took orders. In 1838 he was appointed assistant-keeper of printed books in the British Museum. He gave special attention to Keltic, and wrote many articles in the *Quarterly Review*, and contributed to the *Transactions* of the Philological Society, of which he was a member. Among his works are treatises on *The Languages and Dialects of the British Isles*, on *The Nature and Analysis of the Verb*, and a paper on *The Formation of Ice at the Bottom of Water*.

Garnier-Pagès, ÉTIENNE JOSEPH (1801–1847), was born at Marseilles, where he practised at the bar. He took part in the Revolution of July, and in 1831 became a member of the legislative chamber. LOUIS ANTOINE (1803–1878), half-brother of the above, also joined in the July Revolution, and succeeded to his brother's position, and led the Extreme Left. In 1848 he became mayor of Paris, in 1864 a member of the Corps Législatif, and in 1871 a member of the Provisional Government.

Garo (GARROW), the most primitive branch of the Kachâri people, Garo Hills and Goalpara, Kamrup and Mymensingh districts, West Assam. There are three main divisions—*Abong* in the south-east, *Abengga* in the south-west, and *Achik* elsewhere, with total population about 110,000, of whom over 80,000 are in the Garo Hills. The collective national name is *Mande*, and all speak dialects of a language closely akin to the Bodo (Kachâri) of North-east Assam. The Garo are of Mongolian type, with black, oblique eyes, flat features, dirty yellowish complexion, short, squat figures, sullen expression. Like their Khassia neighbours, they raise rude monolithic monuments, similar to those of North Africa, Brittany, and Stonehenge, and their religion is a gross fetishism, formerly accompanied by human sacrifices. (Dalton, *Ethnology of Bengal*; Major Godwin Austen, *On the Garo Hills*, in *Journal of the Royal Geographical Society*, 1875.)

Garonne, THE, a river of France (Latin *Garumna*), rises in the Spanish Pyrenees, flows through a gorge, and enters France near Pont du Roi, and flows N.W., and, joining with the Dordogne, widens out two or three miles to form the Gironde, and falls into the Bay of Biscay. The islands and banks of the estuary form two channels, and the lower parts are subject to inundation. On the right bank are the tributary Salat, Ariège, Tarn, Lot, and Dordogne, and on the left the Neste, Bouge, Save, Gers, Baise, and Ciron. Boats can go upwards from Toulouse to the junction of the Salat, and sea-going vessels can go thirty-two miles above Bordeaux.

Garonne, HAUTE, frontier department of France, bordering upon Spain, along the Pyrenees. It is 99 miles long by 56 miles broad, and contains 2,428 square miles. The N. is generally fertile, and in parts mountainous, and in the S. the Pyrenees rise to a height of 11,000 feet. All the rivers belong to the Garonne, and the Canal du Midi passes through. The climate is mild, but during part of the year high winds are prevalent. The oak, pine, and fir are the most abundant trees, and among the chief products are wheat, maize, oats, potatoes, and fruits. Cattle and sheep are reared, and the region is especially noted for its mules and its asses. Among the minerals are iron, lead, copper, coal, marble, and granite. Toulouse is the capital.

Gar-pike, a name sometimes given to the garfish (q.v.), but properly belonging to the Bony Pike (q.v.).

Garrick, DAVID, generally acknowledged as the greatest actor that the English stage has seen,

was born at Hereford on the 20th of February, 1717. He received a good education, studying for some little time under Dr. Johnson at Edial, near Lichfield, and with his teacher set out to seek his fortune in London in 1737. Legal studies did not prove attractive, and a year later he joined his elder brother Peter in a wine merchant's business, which partnership, not proving profitable, came to an end in 1740. At last he found his vocation, appearing on the stage in Southerne's *Oronooko* in 1741 at Ipswich, and on October 19th of the same year as Richard III. at the theatre in Goodman's Fields, London. At the latter place his success was phenomenal, and drew down the displeasure of the managers of the two Patent Houses, who succeeded in stopping the performances. Garrick finally settled down at Drury Lane, of which theatre he became joint patentee in 1747, and retained the management till he retired from the stage on June 10th, 1776. When Garrick appeared on the scene, the stage was eaten up with formality and custom, stately declamation and stereotyped attitude and gesture were the actor's stock-in-trade; but against all this he daringly revolted, and soon the artificial gave place to a more natural method of acting. In every class of piece Garrick was eminent, being successful in the highest tragedy and the lowest comedy. His variety was infinite. As a dramatic author he was more voluminous than meritorious, but many of his shorter verse productions are bright and clever. He was frequently accused of pettiness and meanness, and probably his character was not altogether estimable; but his invariable success doubtless irritated many who considered themselves injured by his triumphs. He died on the 20th of January, 1779. He married in 1749 Madame Violette, a famous dancer, who survived him till 1822.

Garrison, WILLIAM LLOYD (1805-1879), a noted American abolitionist, was born at Newburyport in Massachusetts. His father, a sea-captain, disappeared, and his mother was left in poor circumstances. The boy tried his hand at shoe-making and at cabinet-making, and eventually was engaged in the printing department of a local newspaper, for which he wrote anonymously, and he also wrote some political articles for the *Salem Gazette*. In 1829 he went to Baltimore, and joined with a Quaker philanthropist, Mr. Lundy, to advance the cause of emancipation. Mr. Lundy was in favour of gradual emancipation and the foundation of a free colony in Africa, but Garrison was more uncompromising, and advocated immediate and total emancipation and the bestowal on the blacks of full citizenship. In the course of his efforts he rendered himself liable for libel, and was imprisoned. In Boston he started the *Liberator* newspaper, and suffered much privation in the early days of the paper. In 1833 he visited England for the first time, and was warmly received by Wilberforce and the other opponents of slavery. Garrison may be looked on as one of the chief causes of the final abolition of slavery in 1864.

Garrot. [WILD DUCK.]

Garrotte, a form of capital punishment in use in Spain and Portugal. In former days the prisoner was strangled by means of an iron collar, which was placed round his neck and fastened to a stake at the back of the chair in which he sat. At the point where the stake and collar met there was a screw, the turning of which resulted in the contraction of the collar. Death is now inflicted by making the screw pierce the spinal marrow where it joins the brain. The term "garrotting" is applied to a kind of highway robbery, in which the robber makes his victim insensible by suddenly compressing his throat.

Garter. The Order of the Garter was instituted by Edward III. in honour of Edward the Confessor and St. George of Cappadocia, probably between 1344 and 1348. Roughly speaking, there are two theories as to its origin. According to one theory, it was established with the definite purpose of encouraging valour in the French war by commemorating victories and rewarding those who specially distinguished themselves. The supporters of the other view appeal to the legend that the king, having in the course of a dance picked up the garter of a lady, whom tradition identifies with the Countess of Salisbury, returned it to her with the exclamation, "*Honi soit qui mal y pense*" ("Shamed be he who thinks evil of it"), which became the motto of the new order. The order originally consisted of the king, the Prince of Wales, and 24 knight-companions, who had stalls in St. George's Chapel at Windsor, where they assembled on the eve of St. George's Day (April 23). Later statutes permitted the election of foreigners and descendants of George III. (1786), George II. (1805), and George I. (1831), in addition to the original number. The right of election was at first vested in the whole body, but was afterwards confined to the king. The officers of the order are the Prelate (the Bishop of Winchester), the Chancellor (the Bishop of Oxford), the Registrar (the Dean of Windsor), the Garter King of Arms, and the Gentleman Usher of the Black Rod. The original insignia of the order were a garter, a surcoat, a mantle, and a hood, to which the collar and George, star, and under-habit were afterwards added. The garter, which is worn a little below the left knee, is now made of dark blue velvet, and has the motto inscribed on it in gold letters. The mantle, surcoat, and hood are all of velvet lined with white taffeta, the colour of the two latter being crimson and that of the mantle purple. The badge, a silver escutcheon bearing a red cross and surrounded by the garter and motto, is worn on the left shoulder of the mantle. The collar contains 26 pieces, roses alternating with knotted cords, and from it hangs the "George," a representation of St. George slaying the dragon.

Garth, SIR SAMUEL (1661-1719), an English physician and poet, was born in the West Riding of Yorkshire, and was educated at Ingleton and at Peterhouse, Cambridge, where he graduated B.A. in 1679, and, after studying at Leyden, M.D. in 1691. He came to London and was F.C.P. in 1693. In 1697 he gave the Harveian oration, in the course

of which he broached the idea of establishing dispensaries where the poor should get good advice and aid free. This idea was strongly opposed by the apothecaries, as surgeons were then called, and they tried every means to thwart its realisation. In 1699 Garth published *The Dispensary*, a poem which seems to have been modelled upon *Le Lutrin* of Boileau and Dryden's *MacFlecknoe*. In 1700 Garth delivered a Latin oration upon Dryden. He also wrote verses for the Kit-cat Club, as well as other poems, and some dramatic prologues. On the accession of George I. he was knighted and appointed physician-in-ordinary to the king.

Gas is a substance whose particles exhibit a tendency to separate from one another. If a quantity of gas be introduced into a closed vessel, that quantity will immediately fill the vessel, retaining neither its original form nor its original volume. A gas may therefore be regarded as a substance possessing no rigidity; the smallest forces may deform it, and a removal of those forces will not necessarily be accompanied by a return to the original shape. This special property is shared with liquids, from which gases are distinguishable by having a very great elasticity of bulk. Small forces may produce very great change in volume. The gaseous condition seems to be one in which the particles of the substance are endowed with a greater amount of kinetic energy than they possessed when the substance was in the liquid form. They are therefore able to separate themselves and to travel about independently in rectilinear courses, except in so far as collisions with other particles may alter their lines of motion. The particles of a given quantity of gas at a certain definite temperature possess a certain amount of momentum, and if this is altered in direction by their collision with the sides of the containing vessel the incessant impact produces a fairly constant and uniform pressure on the sides of the vessel. We say fairly constant, because the particles have not all got exactly the same speed, nor are they all exactly the same distance apart; but, taking them as a whole, they may each be regarded as possessing an average amount of energy, an average speed, and an average distance between each other. If the vessel be diminished in size, the number of impacts it receives per second will be increased, and for the same temperature as before the gas exerts a greater pressure. This is the basis of the kinetic theory of gases developed by Clausius and Clerk-Maxwell which now receives the general support of physicists. Both theoretical and practical considerations have shown that the pressure is inversely proportional to the volume for a given quantity of gas at a constant temperature. If v is the volume of the gas and p its pressure per unit area, the product vp will remain a constant through a wide range of pressures. This law, which is known in England as *Boyle's Law* (q.v.), is not perfectly true, considerable error being found when the pressures are great and the particles of gas too closely aggregated. The second important law of gases is due to Gay-Lussac, who showed that the increase of volume which a quantity of gas undergoes when its

temperature is increased 1° , in order to maintain constant pressure, is a fixed proportion of its initial volume at 0°C . This is expressed mathematically by the formula $v_t = v_0(1 + at)$, where v_t is the volume at the temperature t degrees, v_0 that at 0°C ., and a a constant that is practically the same for all gases, being about $\frac{1}{273}$. This constant is called the *coefficient of expansion*.

Gases may be liquefied by the combined application of great pressure and great cold. For every gas there is a certain temperature, known as the critical temperature, which must be reached before pressure alone can complete the liquefaction. When the gas is below the critical temperature it is called a vapour, and may be liquefied without further diminution of temperature.

Gases vary in their degree of solubility in liquids; 1.050 litres of ammonia are soluble in 1 litre of water at 0°C .; while only .02 litre of hydrogen can be dissolved in the same amount of water. A liquid at its boiling-point may be regarded as being saturated with its own gas, any addition of heat causing the evolution of vapour. The power of conduction of heat for gases is very slight, and is difficult to measure, for true conduction is prevented by the convection which goes on. The specific heat of gases is small as a rule, that of air at constant pressure being .2375, at constant volume .1684; that is to say, a gramme of air raised in temperature 1°C . requires .2375 calories if its pressure remain constant, its volume therefore increasing by Gay-Lussac's law. If its volume be kept constant it requires only .1684 calories to raise its temperature 1°C ., the difference being due to the work done in the former instance by expansion of the air against the external pressure. The specific heat of hydrogen at constant pressure is 3.049, this substance being the unique exception to the rule that the specific heats of all substances are less than that of water. Air at ordinary temperatures and pressures is an insulator of electricity, but at high temperatures and at low pressures it becomes a conductor. Oxygen is strongly magnetic; hydrogen and nitrogen are diamagnetic. [DIAMAGNETISM.]

Gas Analysis. The first operation in gas analysis is the collection of the sample, and this frequently offers a great many difficulties. In ordinary cases the gas is collected in glass vessels over water or mercury, the former being most convenient, but only applicable when the gas to be analysed contains no soluble constituents. The vessels are filled with the liquid, and then by means of a tube attached to their upper end are placed in communication with the chamber, etc., containing the gas. The mercury or water is then run out from below, the gas being thus aspirated into the vessel which, when full, is securely closed. The sample being thus collected, the method usually adopted for its analysis is the absorption in turn of each of its various constituents, by suitable substances, the decrease in volume after each absorption being observed. For this purpose the gas is transferred to a graduated measuring tube, and from this it is forced into the bulb containing the particular absorbent, being again forced back

into the measuring tube. Owing to the alteration of the volume of a gas with variations in the temperature and barometric pressure [GAS], these data must be also noticed at each observation. The principal substances employed as absorbents are the following:—*Caustic potash*, either solid or in solution, which absorbs acids, or their anhydrides, being most frequently used for the determination of *carbonic acid* CO_2 . *Pyrogallol* or *pyrogallie acid*, which is used to absorb oxygen, for which purpose also *phosphorus* may be employed. *Cuprous chloride*, either in acid or in ammoniacal solution, used chiefly for determination of carbon monoxide, acetylene, or oxygen. *Sulphuric acid* (1) *dilute*, by which basic gases, as ammonia, etc., are absorbed; (2) *concentrated*, by which olefiant gas and allied compounds can be estimated. *Bromine* can also be employed for these latter, while *nitric acid* is used to absorb vapours of benzene. Besides these, *alcohol*, *lead acetate*, and other substances are used in special cases. Many gases, however, containing carbon, oxygen, hydrogen, and nitrogen, cannot be estimated by any of the preceding, and these are then determined by exploding with a known and sufficiently large volume of oxygen in a graduated tube known as an *eudiometer*. From the volume of gas before and after explosion, and also the quantity of carbonic acid, CO_2 (determined as above), and of aqueous vapour (found by heating the tube to 100°C.) formed, the quantities of all four constituents in the original gas can be determined. For the determination of a single constituent of gases, special methods are frequently employed—*e.g.* as by absorption in some liquid, and afterwards analysing the solution obtained.

Gas Battery, in electricity, is a voltaic battery first arranged by Grove, in which oxygen and hydrogen act as the opposite poles, and dilute sulphuric acid as the electrolyte separating them. The gases are contained in long glass tubes held in position over the liquid. The terminals of the battery are connected with platinum plates that pass up from the liquid into each tube. The electromotive force available is about 1.5 volts, and is the electromotive force required to separate hydrogen and oxygen from water.

Gascoigne, SIR WILLIAM (*circa* 1350–1419), an English judge, was born at Gawthorpe, in Yorkshire, and educated at Cambridge. He became a member of the Inner Temple, and pleaded in Richard II.'s reign. In 1397 he became King's Sergeant, and held an estate for the banished Duke of Hereford, who, upon his accession, confirmed Gascoigne's patent as King's Sergeant, and made him Lord Chief Justice in 1400. He is said to have tried Northumberland and the other rebels in 1405, but this is very doubtful. The story of his collision with the Prince of Wales and his imprisonment of the prince is probably apocryphal. He appears to have been a good judge, and his son served in the wars of Henry V., and became High Sheriff of York, while his grandson was knighted by Henry VII.

Gascons, the inhabitants of Gascony, south-west France, who are distinguished by some marked

characteristics from all the surrounding populations—characteristics due to their mixed Iberian, Romano-Gallic, and Teutonic (Visigothic) descent. The substratum of the population is certainly Iberian, as shown by their very name—Gascon and Vascon being the same word as Basque [BASQUE]—and by such local names as Elimberis, Bigorra, Iluro and other old Iberian settlements, whose meaning is still explicable by the Basque language (Elimberis = "New-town," etc.) Later, but still in prehistoric times, the country was invaded by Celtic (Gaulish) tribes, who merged with the original inhabitants, forming the mixed Celtiberian peoples, who retained the primitive Iberian speech still surviving on both slopes of the Western Pyrenees. These Celtiberians were the Aquitani of Cæsar (*De Bell. Gall.* i. 1.), who after the Roman conquest (29 B.C.) were grouped in nine administrative districts forming the *Novem populi* of the Empire. After the Visigothic irruption the Vascons of the Pyrenees again acquired the ascendancy, and in the seventh century extended their rule and name to the whole region northwards to the Garonne, which from the remotest times had formed the northern boundary of the Iberian domain. Thus it was that this region took the name of Vascony (Gascony), which it still bears, though since 1790 divided into several administrative departments roughly corresponding to the *Novem populi* of the Romans. The Basque language, however, has gradually retreated to the south-western districts of Navarre and Oleron (the ancient Iluro), and the bulk of the people now speak, besides the standard French, a marked dialect of the Langue d'Oc. The Gascons are distinguished by a higher tone of morality, due perhaps to their Iberian blood, than is prevalent in other parts of France. They are a gay, cheerful, and hospitable people, somewhat boisterous in their demonstration of friendship, great talkers and even charlatans, given much to exaggeration and "bonnee," so much so that the term "gasconade" has become synonymous with brag, bluster, or bravado. The modern "gasconader" represents the *miles gloriosus* of Roman comedy.

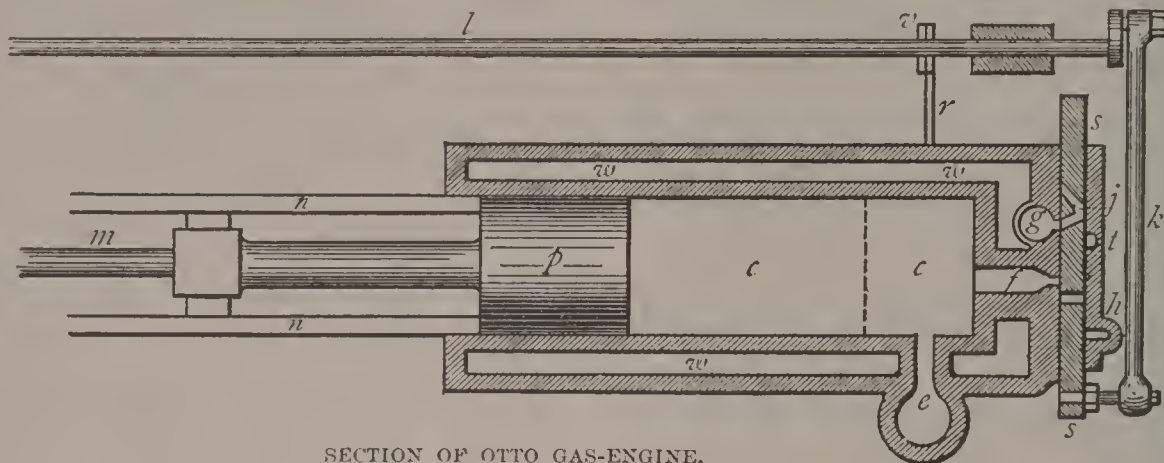
Gascony, an old province of France containing 10,000 square miles, was the Aquitania Tertia of the Romans, and seems to have been settled by "Vasques" or "Vascons" from Spain. These were defeated in 602 by the Franks, but retained their independence, and were governed by their own dukes. In 872 we find them defying the authority of the French kings. The line of dukes became extinct in 1054, and the duchy came into the power of the Dukes of Guienne.

Gas Engine is a motor the theory of whose working is closely connected with that of the steam-engine, but with a motive power supplied directly from the combustion of coal-gas or other similar gaseous fuel. The first successful gas-engine was brought out in 1860 by M. Lenoir, though practical application of the idea dates as far back as 1823. This engine used about 95 cubic feet of gas per horse-power per hour; an efficient gas-engine will now supply one horse-power per hour, with 15 cubic feet of coal-gas, or about 75

cubic feet of Dowson gas, whose combustion value is only about one-fifth of that of coal-gas. The general working of an ordinary gas-engine is as follows:—A piston works backwards and forwards in a cast-iron cylinder. At the beginning of a stroke the piston moves forwards and draws in a supply of gas and air combined in proper proportions for complete combustion. The mixture is ignited by some special contrivance that will not involve any escape into the outer air; explosion ensues, and the temperature rises rapidly to about $3,000^{\circ}\text{C}$. The pressure undergoes a corresponding increase of from 180 to 200 lbs. per square inch, and the piston is thrust forward. The engine is single-acting, that is to say, explosions are only made to

temperature, both expressed in degrees Centigrade. With the ordinary modern ranges of temperature in a steam-engine t_2 rarely exceeds 195°C ., and t_1 is about 45°C . This gives a maximum efficiency of .32, which means that only 32 per cent. of the heat supplied to the steam can be utilised in doing actual work. The combined efficiency of furnace, boiler, and engine in actual practice seldom exceeds 12 per cent. in large engines, and 4 per cent. in small ones.

With the internal-combustion engine, however, of which the gas-engine is the best-known representative, the whole energy of combustion is in the gas itself; the furnace is not a separate construction, and loss of heat is thereby prevented. A



SECTION OF OTTO GAS-ENGINE.

p , Piston; c , cylinder; ss , slide; g , tube; t , main gas-supply pipe; j , special valve; f , tube in cylinder; w , water-jacket; r , lever; e , exhaust port; r' , rotating cam; l , shaft; k and m , connecting-rods; n n , parallel guides.

take place on one side of the piston—the return stroke of the piston being effected not by a return thrust of high-pressure gas, but by the inertia of the moving parts, which carries the piston back to its original position. It is connected by means of a piston-rod and connecting-rod of the ordinary kind to a crank, and a reciprocating motion of piston is rendered capable of producing a rotatory motion of the shaft to which the crank is connected. A fly-wheel is fixed on the crank-shaft, and stores up enough energy in the forward stroke of the engine to carry the piston back in the backward stroke, and to regulate the supply of energy that is drawn from the engine. The temperatures attained in the cylinder are so high that the parts in contact with the burning gas would be rapidly burnt away but for the special provision of a *water-jacket* to the cylinder. This is a hollow casing through which cold water constantly circulates; the water draws off heat continually, and so prevents the attainment of too high a temperature of the cast-iron cylinder. The objection to the water-jacket is that it necessarily involves great loss of heat, which is abstracted without doing any useful work. Before entering on the fuller detail of a modern gas-engine, it may be remarked that the efficiency of such motors is much greater than that of a steam-engine. The maximum efficiency that is theoretically obtainable with a heat-engine is measured by the fraction $\frac{t_2 - t_1}{273 + t_2}$ where t_2 is the highest temperature employed with the working material and t_1 its lowest

temperature of $1,600^{\circ}\text{C}$. may be regarded as the maximum available, and as the gas is passed into the exhaust at a temperature of about 400°C ., this may be regarded as the minimum. These numbers applied in the above efficiency formula give 64 per cent. as the highest possible efficiency available with these given temperatures. In actual practice, taking into account the various losses, about 23 per cent. is usefully employed in doing work. Low as this is, it compares favourably with the results obtained with the steam-engine.

The accompanying sketch represents a diagrammatic section of the ordinary Otto gas-engine, which is one of the best-known modern engines. An explosion can only occur once in two revolutions of the crank-shaft; there are thus four strokes to each firing. Taking the first of these to start the cycle of operations, the heavy piston p starts moving to the left from the dotted line shown in the cast-iron cylinder c . The slide ss is during this stroke so placed that air is drawn into the cylinder from the tube g at the same time that gas is drawn in from the main gas-supply pipe t . Both air and gas pass in by the special valve j , which during this process connects both g and t with the tube f in the cylinder. During the return stroke the air and gas supplies are cut off from the cylinder by motion of the slide, and the enclosed mixture suffers a certain amount of compression, a process that it is very desirable to introduce before combustion. At the beginning of the third stroke a small amount of gas and air, that has been enclosed in the slide, is ignited by a flame at h

and conducted to *f*. It immediately starts the combustion in the cylinder; the temperature and pressure rapidly rise, the latter having an average value of about 660 lbs. per square inch during the first fifth of a second of combustion. After this, the pressure falls during the remainder of the stroke, though it must not be supposed that the combustion is completely over in that short interval of time. Much heat is taken away by the water-jacket *w*, which is to protect the lining of the cylinder from being burnt away by the intense heat. Towards the close of this third stroke the lever *r* is made to open the exhaust port *e* by means of a rotating cam *v* on the shaft *l*, and the hot gases pass away to the exhaust. The fourth stroke, which completes the cycle and brings the piston back to its original position, simply drives the gaseous products of combustion through the exhaust pipe. This is closed at the end of the stroke, so that a new supply may be drawn in. The same shaft *l* regulates the motion of the slide by means of the small connecting-rod *k*. The shaft is itself rotated by bevel-gearing that connects it with the crank-shaft of the engine. The cross-head of the piston-rod runs in parallel guides *n n*, and is joined up with the main crank by the connecting-rod *m* in the usual way.

Gas Heating. Complete burning of a combustible gas affords a certain amount of heat, which may be usefully employed for various purposes. In recent times the heat obtained by the combustion of coal-gas has been utilised in many ways. For domestic use the gas has been introduced into specially-constructed grates and there burnt by means of suitable burners, so that their heat may be given to blocks of asbestos, to a mixture of asbestos and coke, or to certain other similar materials, which become incandescent and radiate the heat outwards. This prevents the heat passing by convection directly up the flue or chimney; the obnoxious products of combustion pass up the flue, but a fair percentage of the heat is diverted into the room. For cooking purposes coal-gas is extensively used. Special gas-ranges are now designed, by means of which hot gas-flames may be produced by more complete combustion of the gas than obtains with the ordinary gas-flame employed in illumination. The heat thus produced is localised in that region where it is most wanted, such as, for instance, immediately below a kettle or saucepan placed in position on the grate, and the boiling of water or other such culinary operation rapidly ensues. With regard to the special purpose just mentioned, that of the production of boiling water, various patents have been brought out, depending upon the local application of heat obtained from gas. Water may be rapidly heated by passing through thin metal tubes or over thin plates, the other side of which is subjected to the heat of the gas-flame. This is very useful for the preparation of warm baths and the like.

In engineering and various arts coal-gas and other similar products have been in extensive use for some years. In the gas-engine (q.v.) the combination of coal-gas with a suitable amount of air is made to

produce an explosion in a cylinder, to cause a rapid increase in the temperature, and a consequent increase in pressure of the gaseous mixture; and the energy thus developed is directed so as to produce a reciprocating motion of a piston, and by suitable mechanism a rotatory motion of shafting and wheel-gearing. Special combustible gases, known as *producer-gas*, *water-gas*, and *Dowson gas*, are obtained by passing limited supplies of air or of air and steam through incandescent coke. This fuel is fairly cheap, and is much utilised for heating retorts in coal-gas making, in metallurgical operations, in glass and pottery works, boiler-heating, and in gas-engines. In various parts of the earth, such as Baku, China, and specially in North America, natural gas issues from the ground, and is employed similarly. Some varieties of this natural gas are useful for illumination.

There can be no doubt that the great advantage of smokeless burning is possessed by gas-fuel, though certain disadvantages also attend its use.

Gaskell, ELIZABETH CLEGHORN (1810–1865), an English novelist, was born at Chelsea. Her early days were not very tranquil, and she was brought up by an aunt. At 15 she went to Stratford-on-Avon, and here she learnt Latin, French and Italian. In 1832 she married the Rev. W. Gaskell, an Unitarian minister at Manchester. In 1848 she published *Mary Barton*, which dealt with one phase of life from the worker's point of view. This was very well received, and brought her the acquaintance of Dickens, Carlyle, and Thackeray. She wrote in *Household Words*, and in the *Cornhill Magazine*. In 1853 appeared *Ruth*, and scattered fragments were gathered up into *Cranford*. In 1855 *North and South*, which presented the question of *Mary Barton* from another point of view, appeared in *Household Words*. In 1857 she wrote the *Life of Charlotte Brontë*, one of the most charming of biographies, though certain statements in it given on the authority of Miss Brontë brought Mrs. Gaskell into some annoyance. In 1863 appeared *Sylvia's Lovers*, and the idyllic *Cousin Phillis*. Her last work, unfinished, *Wives and Daughters*, appeared in the *Cornhill Magazine*.

Gas Lighting is a method of illumination by means of the combustion of coal-gas (q.v.), which is prepared from coal by destructive distillation. Various investigations were made by scientific men concerning the combustible gases that issued from mines in the coal district as far back as 1640. In 1787 Lord Dundonald tried experiments at home on gaslight. In 1813 Westminster Bridge was lit by coal gas, and since then the adoption of this means of illumination has been extensive throughout civilised countries. In most important places in this country the gasworks have now become the property of the local authorities.

The best coal for the purpose is intermediate between anthracite and lignite, of the ordinary bituminous kind. But to prevent the formation of a residue of useless ash it is customary, when employing this kind of coal, to mix it with a certain proportion of harder coal that will give a residue of fairly good coke. The importance of choosing a mixture that

gives a good residue is due to the fact that the liquid and solid ingredients which remain after distillation are of considerable value. For example, a ton of good cannel coal distilled between 750° and 800° F. will yield 68 gallons of oil (from which are obtained 2 gallons of paraffin spirit, $22\frac{1}{2}$ gallons of lamp oil, and 24 gallons of heavy oil and paraffin), 1,280 lbs. of coke, while it yields 1,400 cubic feet of gas. If the same be distilled for ordinary gas production in the usual way it yields $18\frac{1}{2}$ gallons of coal-tar (from which are obtained 3 pints of benzol, 3 pints coal-tar naphtha, and 9 gallons of heavy oils) and 1,200 pounds of coke. The distillation must not be prolonged too far if the candle-power is to be a maximum.

The candle-power of the gas is estimated by means of a standard burner burning 5 cubic feet of coal-gas per hour. The burner is either a Sugg's London Argand No. 1, or a standard Steatite Batswing burner. The light is compared with a standard candle (which is a sperm candle 6 to the pound, each burning 120 grains per hour), and it is found that ordinary gas possesses a candle power of 16 to 20 when estimated in the above manner. Better gas can be made, giving a power of 25 to 30 candles.

The general processes for the perfection of the gas when first distilled are given in the article on coal-gas. From the purifier the gas passes to a meter for measuring the quantity of gas manufactured, then through various pressure gauges and recorders, and on through a governor which regulates the flow. Finally it passes into the gas-holder, which is an inverted hollow cylinder of wrought-iron held over water that is contained in a cylindrical tank of stone, brick, concrete, or metal. The tank is usually below ground for convenience. As gas passes into the holder the cylinder rises. It is enabled to rise without difficulty by means of counterweights and vertical guides. The counterweights very nearly balance the weight of the vessel, which therefore only exerts a slight fraction of its weight upon the enclosed gas. Nevertheless the slight pressure of the gas which enters the meter must be sufficient to raise the cylinder. Thus the holders act as reservoirs to supply sufficient gas when the demand is great and store it up when the demand is slight. They are usually made large enough to contain a 24 hours' maximum supply. They also serve to equalise the pressure in the mains. These mains are of cast iron, the joints of the various sections being carefully rendered gas-tight by caulking or by the use of white- and red-lead, indiarubber, or rust cement. Branches pass from the mains to the consumers, each of whom is supplied with a meter to measure the amount consumed.

Gas-meters are of two kinds, dry and wet. The *dry meter* is an arrangement by which the pressure of gas sends forward a piston or diaphragm first one way along a cylinder and then the other way. The gas on one side of the piston when the cylinder is full is allowed to pass on for consumption, and the piston then returns by pressure of gas on the other side. As each stroke of the piston is made a lever is moved which records the stroke

and so measures the quantity of gas passed. The *wet meter* is rather complicated in construction. It consists of a small inverted cylinder containing 4 spiral chambers. The cylinder is mounted over water on a vertical axis, and as gas passes into one of the spiral chambers the cylinder is slowly rotated. When one chamber is full, the succeeding one is rotated into a convenient position to be filled by gas, and the gas in the first is allowed to pass on by an orifice which discloses itself at the top. The amount of rotation measures the amount of gas supplied, and is recorded on a dial.

Of gas-burners there have been many types invented. It is important that each burner should be governed, as too great a pressure will give a bad flame. The usual burners are of the batswing and fishtail types. The former has a slit across the top of the burner; the latter has two passages meeting at an angle with each other, causing the flame to spread out into a thin sheet. The Argand burner has a hollow ring of flame formed by a number of holes arranged in a circle. The Argand is improved by having a porcelain cylinder in the middle of the flame; it keeps the temperature uniformly high, and also serves to emit light itself when incandescent. The ordinary gas may be improved by being passed through melted naphthaline. It takes up some of this heavy hydro-carbon and is improved in lighting power in consequence. This is the ordinary albo-carbon principle. The average cost of ordinary gas burned in a fairly good burner with a lighting effect of 8 candles is about 1s. per candle per 1,000 hours. Wax candles cost about 34s. per candle per 1,000 hours. Electric arc lamps of 1,500 candle-power cost, on an average, $2\frac{1}{2}$ d. per candle per 1,000 hours; while electric incandescent lamps of 16 candle-power cost about 2s. 8d. per candle for the same time.

It is not desirable that the same gas should be employed both for lighting and for heating purposes. It may serve the one function efficiently, but not the other. Nevertheless the evident simplicity of this arrangement, demanding only one set of gas-producers and only one set of supply-pipes, is a great argument in favour of the system.

Gas-lighting is being gradually displaced by electric-lighting, but the vested interests in the former are of such magnitude and have such inertia that its retrograde movement is very slow.

Gas Liquor. In the manufacture of coal-gas (q.v.) a large quantity of a liquid distillate is produced and collected in suitable receivers. This distillate consists of two parts, a *tarry* liquid [COAL-TAR] and an *aqueous*. The latter, which is known as *gas liquor* or *ammoniacal gas liquor*, is, ordinarily, a slightly yellow liquid with an ammoniacal and fetid smell. It contains small quantities of tarry matters and benzene compounds and a considerable amount of ammoniacal salts, chiefly the carbonate, and sulphide. To these the gas liquor owes its commercial value, and it is largely employed for the production of ammonia and its salts, being at present almost the sole manufacturing source of these compounds. To obtain them, steam is blown through the liquor, by which means some

of the ammonia salts are decomposed, and free ammonia mixed with steam passes off. Many manufacturers add lime also to the gas liquor to make the decomposition complete. The mixed steam and ammonia is then either (1) condensed, forming what is known as *concentrated gas liquor*, consisting chiefly of an impure solution of ammonia, or (2) is passed into sulphuric acid contained in lead chambers, by which means *ammonium sulphate* is produced and crystallises out. This is then either sold—being employed largely as a manure—or used further for the production of pure ammonia and the other salts of this substance.

Gasoline is the name given to some of the lighter and more volatile portions obtained in the distillation and purification of crude petroleum. It is a very volatile liquid with boiling-point varying from about 35° to 80° C., which consists mainly of a mixture of the hydrocarbons—*pentane* (C_5H_{12}), *hexane* (C_6H_{14}), and *heptane* (C_7H_{16}). [PARAFFINS, PETROLEUM.]

Gaspé, a peninsula in the province of Quebec, Canada, in the Gulf of St. Lawrence, between the estuary of the St. Lawrence and the Bay of Chaleurs. The chief occupations of its inhabitants are fishing and lumbering.

Gas Producers. In many metallurgical operations gaseous fuel is employed as a source of heat. In these cases the gas does not require to be of the same degree of purity as when used for purposes of illumination, and is usually manufactured by the distillation of coal-slack, etc., brought about by the combustion of part of the coal itself. The manufacture is carried on in what are known as *Producers*, many forms of which are in use—*e.g.* Siemens', Casson's, etc. They all consist of large chambers of fire-brick, or iron lined with fire-brick, provided with *hoppers* for the introduction of the coal, etc., in which the fuel is burned in an insufficient supply of air. A blast of steam is also usually blown through, which serves not only to increase the pressure of the gas and produce a draught, but also causes a greater quantity of gas to be formed. The products then pass into large iron tubes or culverts, leading usually direct to the furnace in which the gas is to be employed. Producer gases thus prepared consist chiefly of various *hydrocarbons*, resulting from the distillation of the coal, *carbon monoxide* (CO), resulting from the incomplete combustion, and *hydrogen* present owing to the decomposition of the steam. They are usually mixed with air and heated before admission into the furnace, as by these means a higher temperature is obtained.

Gassendi, PIERRE (1592–1655), a French philosopher, was born in Provence. He went to school at Digne, and then to Aix. He returned to Digne, where he lectured in theology. In 1617 he was ordained priest and appointed Professor of Philosophy at Aix. He was dissatisfied with the scholastic philosophy which passed under the name of Aristotelianism, and in 1624 expressed his views in *Exercitationes Paradoxicæ adversus Aristoteleos*. After travelling for some years, he was appointed in 1645 Professor

of Mathematics at the Collège Royal of Paris. He had a great regard for the philosophical system of Epicurus, and in 1647 wrote *De Vitâ, Moribus, et Doctrinâ Epicuri* in eight books. After again travelling for his health, he returned to Paris in 1653, and wrote lives of Copernicus and Tycho Brahe. His great work, *Syntagma Philosophicum*, shows him to have been eclectic and by no means consistent in his eclecticism. He has been described as a philosophical man of letters and a literary philosopher. The theory of “primary and secondary qualities of matter” (*i.e.* that colours, smells, etc., are due to the action on our senses of the particles of matter, which in themselves are only extended, solid, and mobile), which has been important in the philosophy of the last two centuries, was reintroduced by him directly from Epicurus.

Gasteromycetes, the order or sub-class of the Basidiomycetes (q.v.) that possess *angiocarpous* or closed fructification. Their compound sporophores often reach a large size, some puff-balls exceeding a foot in diameter, and in almost all cases they are invested by a thickened membrane or *peridium*, which is often produced inwards so as to divide up the fungus into hymenial chambers. Among the chief forms are the *Lycoperdaceæ* or puff-balls, including *Geaster*, the earth-stars; and the *Phalloideæ* or stink-horns.

Gastralgia (Greek, *gaster*, the stomach, *algos*, pain), the term applied to the pain which is associated with certain morbid conditions of the stomach.

Gastreadæ. [GASTRULA.]

Gastric Fever, a term very loosely applied and practically superseded since the recognition of the disease of enteric or typhoid fever.

Gastric Juice. [DIGESTION.]

Gastritis, inflammation of the mucous membrane of the stomach.

Gastrochænidæ, a family of Lamellibranchs or bivalve molluscs. These animals are marine and live near the shore, where they burrow into mud or rocks. The bivalve shell is thin, and, in most species, soon ceases to grow; there is, however, an accessory shell secreted by the outer surface of the siphons; this forms a tube open at both ends. A familiar instance of this group is *Aspergillum* (q.v.).

Gastropoda, a class of Mollusca, including the common univalved forms, such as the whelks and winkles, those with numerous valves, such as the Chitons, as well as many, such as the slugs, in which the shell is rudimentary or absent. They belong to the group Glossophora (q.v.), as they possess a distinct head and are armed with a toothed tongue or radula. The main character by which they are separated from the other classes of Glossophora is the condition of the foot; this is normally simple in shape, and is median in position; it is flattened into a large sole, and as the animal crawls about on this, the name of Gastropoda (or belly-footed) has been given to the group. The foot may be divided by transverse constrictions into three divisions,

known as the pro-, meso-, and meta-podia. The metapodium may be expanded into a flat swimming paddle in the free-swimming forms, such as the *Natantia* (e.g., *Atlanta*, *Carinaria*). The metapodium also often bears a horny or calcareous plate, known as the operculum; by this the mouth of the shell is closed. This must not be confounded with the "epiphragm," or horny covering, secreted by many snails as a protection for the mouth during winter; most English snails form such an epiphragm, whereas there is only one (*Cyclostoma elegans*) with an operculum. The shell is the most important part of the skeleton in Gastropods, and is extremely varied in form. The simplest type is simply a low flat cone, covering the dorsal side of the animal as in the Limpet (*Patella*); this may be closed above as in *Patella*, or have an aperture at the summit of the cone as in *Fissurella*, the Keyhole Limpet. In the next form the cone elongates as in the long tubular shells of *Vermicularia* and its allies, once included among the worms; the elephant-tooth shell (*Dentalium*) is a similar cone, but it is not now included among the Gastropoda. In some of the *Vermetidae* the shell is coiled at one end; in other genera this coiling becomes more pronounced till the shell is a long compact spiral, as in *Cerithium* or *Turritella*, or a flat disc-shaped coil as in *Planorbis*; the former are usually coiled round a central solid rod (the columella), but this may be absent and a central cavity (the umbilicus) runs partially or wholly up the centre, as in the Wentle-traps (*Scalaridae*). The shell may, however, have been formed from the twisting of a short, broad tube, instead of a long cylindrical one, the last whorl of the resulting shell will then be large, and have a wide mouth, as in the whelks (*Buccinum*) or winkles (*Littorina*); in extreme cases, such as Venus' Ear-shell (*Haliotis*), the coil may be almost suppressed and hidden in the large, expanded saucer-like shell. In the family of the Chitons the shell consists of eight plates, each like an inverted V, placed in an overlapping series, which completely covers the back of the mollusc. In the slugs the shell may consist of a small internal plate, or it may be represented by a few spicules, as in *Arion*, or it may be quite absent. The head is always distinct, and it is often extended into a rostrum, which may be a retractile proboscis (as in the whelk) or non-retractile as in most other Azygobranchs. The heart usually consists of but one auricle and one ventricle, but a few forms, such as *Haliotis* and *Fissurella*, have two auricles. The nervous system is on the normal molluscan plan of three pairs of ganglia; the extent to which the commissures which connect these have been involved in the torsion to which the dorsal hump has been subjected in most of the Gastropods with coiled shells, is used very largely as the basis of the classification of the group.

As regards their mode of life, they are mostly marine, and live creeping over rocks or sea-weed; those in which the mouth is "entire" live on algæ and other vegetable forms of life, whereas those in which the mouth is notched by a groove (e.g. the whelks) are carnivorous; these bore through the shells of other molluscs with their long, armed tongue, and then suck out the animal with their

proboscis. Others, such as *Carinaria*, swim about by the posterior expansion of the foot known as the *metapodium*; a few are parasitic, such as *Entocaccha mirabilis*, which lives in Holothurians. Others live in fresh-waters, such as *Paludina*, *Limnaea*, and others of our common pond and river snails. One group—the Pulmonata—live on land, and are distributed widely throughout the world.

The range in time of the class is very extensive. The first representatives occur in the Cambrian; *Murchisonia* and *Loxonema* are common Palæozoic (q.v.) genera. It first becomes of great importance in the Trias and Jurassic, as in the St. Cassian beds of the Tyrol and the Great Oolite of our country. In the Cainozoic (q.v.) era they are to geologists the most important of all fossils.

The most recent and generally accepted classification of the class is as follows:—

Group I.—GASTROPODA ISOPLEURA.

Elongated forms retaining their primitive bilateral symmetry, and with a pair of straight nerve cords, running the full length of the body.*

- (1) Polyplacophora, e.g. the Chitons.
- (2) Neomeniæ.
- (3) Chaetoderma.

Group II.—GASTROPODA ANISOPLEURA.

The primitive bilateral symmetry retained in the head and foot, but lost in the visceral mass.

I. STREPTONEURA.—The nerve loop to the viscera twisted. Sexes separate.

- (1) Zygobranchia—
 - a. Ctenidiobranchiata, e.g. *Haliotis*, *Fissurella*, etc.
 - b. Phyllidiobranchiata, e.g. *Patella* (Limpet).
- (2) Azygobranchia—
 - a. Reptantia, e.g. *Trochus*, *Paludina* (Pond Snails), *Buccinum* (Whelks), etc.
 - b. Natantia, Heteropoda (q.v.).

II. EUTHYNEURA.—The nerve loop not twisted; hermaphrodite.

- (1) Opisthobranchia—
 - a. Palliata, e.g. *Bulla*, *Aplysia* (Sea Hare).
 - b. Non-palliata (Sea Slugs), e.g. *Eolis*, *Doris*.
- (2) Pulmonata—
 - a. Basommatophora, e.g. *Planorbis*, *Limnaea* (Pond Snails).
 - b. Stylommatophora, e.g. *Helix* (Land Snails), *Limax* (Slugs).

Gastrostomy (Greek *gaster*, the stomach, and *stoma*, a mouth), the operation of introducing a tube into the stomach for purposes of artificial feeding. This proceeding is necessitated when the œsophagus or gullet is rendered impassable in certain diseased conditions.

Gastrotomy (Greek *gaster*, and *tome*, a cutting), the operation of opening the peritoneal cavity—i.e. the cavity of the abdomen.

Gastrula, the name of the stage in development which is passed through by all Metazoa or multicellular animals. It consists of a simple spherical or egg-shaped sac, composed of a double layer of cells with an opening (the blastopore) at one end. In one group of animals (the Gastreadæ) the adult condition is not more advanced than this. [See BLASTOSPHERE for the general sketch of the early development.]

* The most important characters only are mentioned.

Gasvolumeter, a form of apparatus devised by Professor Lunge, which is of great use for the speedy estimation of many substances. In all cases this is effected by the measurement of the volume of gas evolved by some reaction, the advantage of the instrument over the ordinary *nitrometer* (q.v.), of which it is a modified form, being that all calculations for varying temperatures and barometric pressure are obviated.

Gatchina, a town in the government of St. Petersburg in the district of Tsarskoselo, Russia. It is 29 miles W. of the capital, in a wooded and marshy flat near the White and Black Lakes, and is approached by the Warsaw line of railway. Here, in 1770, a palace was founded by Prince Orloff, the designs being supplied by Rinaldi. The present Tsar has resided therein during the greater portion of his reign, surrounded by a cordon of troops, and a cloud of police spies. The town also contains four Greek churches, a Protestant chapel, a founding asylum, a military orphanage, a hospital, and a porcelain factory. In one of the churches are relics brought from Rhodes to Malta by L'Isle Adam, Grand-Master of the Knights Templar.

Gates, HORATIO, born at Maldon, Essex, in 1728, entered the English army, and, having accompanied Braddock in his disastrous American expedition, settled in Virginia in 1763. On the outbreak of the War of Independence he was appointed adjutant-general, and subsequently commanded the colonial forces on Lake Champlain. In 1776 he defeated Burgoyne, and received his surrender at Saratoga, but four years later was routed by Cornwallis at Camden, South Carolina. His conduct formed the subject of an inquiry, which resulted in his complete exoneration. After manumitting his slaves, he left Virginia in 1800, and went to live in New York, where he became a member of the legislature, and died in 1806.

Gateshead, a parliamentary and municipal borough in the county of Durham, on the right bank of the Tyne, opposite Newcastle, with which it is connected by three bridges. It was originally a Roman outwork, and grew into a borough before the 11th century. For centuries it was governed by the Bishops of Durham, but in 1695 it received the privilege of electing two stewards to manage its affairs, and in 1826 it became a municipality. It returns one member to Parliament. The town consists of two principal streets nearly parallel, and from these diverge many others. They are fairly built, and a great fire in 1854 was followed by considerable improvements. Iron-works, foundries, locomotive-factories, ship-building yards, glass-works, chemical and soap manufactories and tanneries provide occupation for a large population. The North-Eastern Railway has its chief depôt here, and in the neighbourhood are large coal-mines, and stone-quarries. There are a public park, an ancient cruciform parish church, and a grammar school.

Gath (Heb. "wine-press"), the name of several places in Palestine, the most famous of which was one of the five Philistine cities. According to

Scripture (1 Sam. xvii. 2, 52), Gath must have been near the valley of Elah, about 32 miles W. of Jerusalem.

Gatling, RICHARD JORDAN, M.D., the son of a mechanical engineer, was born in North Carolina in 1818. His early years were passed in assisting his father; but in 1844 he began a course of medical study. He does not appear, however, to have practised his profession, and in 1849 he settled at Indianapolis, where he engaged in railway enterprises and land speculations, bringing out several mechanical inventions. In 1861 he perfected the revolving gun with which his name is associated. The inventor set up a factory, and embarked on other experiments which have resulted in an improved method of casting large ordnance, in the building of several torpedo-boats, and in a pneumatic gun, for the discharge of modern explosive shells.

Gauchos, the collective name of the semi-nomad, Hispano-American inhabitants of the pampas, or grassy steppe lands of the Argentine Republic. They are essentially a pastoral people, who are said to take their name from the Araucanian word *gachu*, meaning "friend," "comrade," and used as a form of courteous salutation between strangers meeting in the wilderness; but the etymology is doubtful. The Gauchos live entirely in the saddle, and, being excellent horsemen skilled in the use of the lasso and bolas, are employed, like the North American "cowboys," to look after the half-wild herds of the Argentine stock-breeders. They are excessively polite and hospitable, and Darwin assures us that he never met with "even one instance of rudeness or inhospitality" from any of them (*Voyage Round the World*, ch. viii.) All speak Spanish exclusively, and, in fact, are of nearly pure Spanish descent.

Gaudeamus, the first word of a popular German students' song, written in dog-Latin. The first line is *Gaudeamus igitur juvenes dum sumus* ("So let us be merry while we are young"). It was first published in 1776.

Gauge is a measuring instrument. A *pressure gauge* is an instrument for measuring the pressure of a fluid such as the steam in a boiler. The most generally adopted pressure gauge is that known as Bourdon's (q.v.), which admits the fluid into a curved hollow tube of special section, closed at the extreme end. The internal pressure tends to straighten out the tube, which is fixed at the open end so that the closed end is free to move under the action of the internal force. Its motion is communicated to a pointer on a graduated dial and the pressure is thus estimated. Similar in principle is the ordinary *vacuum gauge*, to measure the degree of vacuum produced in steam-engine condensers, or in air-pump receivers. In this case the hollow tube is connected with the exhausted space; and the external pressure being in this case greater than the internal, the tube will exhibit a reverse action and become more curved. The recording part of the instrument is the same as before.

The *Wire Gauge* (q.v.) is for the purpose of

determining the diameter of wires, and is of much importance in modern electrical work. The simplest form consists of a plate of steel in which slits are cut of various widths. Each slit is numbered, and the diameter of the given wire is expressed by the number of that special slit into which it exactly fits. There are, unfortunately, various systems of numbering, the Birmingham wire gauge (generally termed B.W.G.) being the most widely adopted. It would be much more convenient in many ways to give the width of each slit in decimal parts of an inch.

Wind Gauge is an instrument for measuring the intensity of wind-pressure, and is generally of the windmill type, the amount of rotation of a small windmill of special construction giving the average intensity of the wind during a known interval. [ANEMOMETER.]

Rain Gauge (q.v.) measures the number of inches of rainfall in a given period of time, by collecting the rain in a graduated vessel, taking care to prevent loss by evaporation or other causes.

Gauge-notch in hydraulics is an arrangement for measuring the quantity of water flowing past any section of a small stream. It is a V-shaped or rectangular notch cut out of a board which is fixed across the channel in such a way that the water has to flow through the notch. It must have sharp edges to give accurate results, which are calculated from the dimensions of the notch and the head of water behind it.

The word *gauging* is employed to denote the measurement of the capacity of casks.

Gauge in railway engineering denotes the distance apart of the rails, measured from centre to centre. The ordinary gauge in England is 4 feet 8½ inches; the old Scottish gauge is 5 feet 6 inches; the Irish gauges 6 feet 2 inches, and 5 feet 3 inches; and the *broad gauge* employed until recently on the Great Western Railway was 7 feet. A narrow gauge railway of 1 foot 11¾ inches is used for passenger and slate traffic at Ffestiniog in North Wales, and gauges of two and three feet, and one metre, are common, on "light railways," in various parts of the world. [RAILWAYS.]

Gault, a provincial name for a blue clay applied in English geology to the Albion or lower division of the Upper Cretaceous rocks. As developed in England, it is generally a stiff blue marine clay, sometimes slightly calcareous, sandy, or micaceous, containing abundant nodules of iron-pyrites, generally a layer of phosphatic nodules near its base, and a large number and variety of pyritised or phosphatised fossils. It often overlaps the subjacent rocks unconformably and varies from 100 to 150 or even 200 feet in thickness. In the Isle of Wight it is termed "blue slipper," from the tendency of overlying porous strata to slide over it, producing landslips (q.v.). The Gault may be examined about Barnwell in Cambridgeshire, at various points in the Weald, and especially near Folkestone, where it has been subdivided into eleven palæontological zones (q.v.), of which seven belong to the Lower Gault or *Hamites rotundus* section, and four to the Upper Gault or *Inoceramus*

sulcatus section. Of 240 fossils, 124 are peculiar to the Lower, 59 to the Upper, and only 39 common to both. Gastropods and bivalves abound in the Lower, with such cephalopods as *Hamites*, *Criocercs*, *Ancyloceras*, etc., and several species of small crabs; whilst *Scaphites* occurs in the Upper, and numerous ammonites throughout both divisions, often retaining their nacreous or pearly lustre. *Dentalium* and *Belemnites* are also common, and fir-cones indicate the proximity of land. The Gault forms a stiff soil mostly in pasture and known as "black land." It bears fine trees, especially oaks, and it is dug for brick-making.

Gaur, GOUR (*Bos gaurus*), a large and very fierce wild ox, with short, strong horns, and without a dewlap. It is found in small herds in the table-lands of South Berar. The only one hitherto brought alive to Europe died in the Zoological Gardens, Regent's Park, in 1892.

Gaur, or GOUR, a deserted city in Bengal, situated some 4 miles S. of Malda, between the Ganges and the Mahananda rivers. The name, originally Gauda, and signifying "sugar country," was applied to a large area. According to Hindu tradition, Gaur was the seat of a long succession of dynasties, and was known as Lakshnaoti. At the end of the 12th century it fell into Mohammedan hands, and resumed its ancient appellation, becoming the capital of the quasi-independent kings of Bengal. About the close of the 16th century they came to an end, a pestilence devastated the place, and it dropped out of history, though it would appear to have had some population as late as 1750.

Gaurian, a general name for the Neo-Sanskritic languages of India, proposed by Professor Hoernle and accepted by Bishop Caldwell and other recent philologists. The five chief languages of the Gaurian group are Hindi, including Hindustāni; Bengali; Uriya of Orissa; Gujarāti; and Panjābi; and these are the *Panch Gaura*, or "five Gaurian tongues" of the natives. They are all derived from Sanskrit through intermediate Prakritic (vulgar) idioms by analytical processes and phonetic changes analogous to those by which the Romance (Neo-Latin) tongues flow from Latin. The oldest extant monument of a Gaurian language is the *Chand Bardai*, a Hindi poem by Prithirāja Raso, who flourished in the 12th century. (E. L. Brandreth, *The Gaurian compared with the Romance Languages*, in *Jour. Asiatic Soc.*, August, 1879.)

Gauss, KARL FRIEDRICH, was born in Brunswick in 1777, and devoted himself to astronomy. He won the Lalande medal of the French Institute for calculating the elements of the orbits of Ceres and Pallas, and in 1807 was appointed director of the Göttingen observatory. In 1821 he undertook the triangulation of Hanover. He next directed his attention to magnetic phenomena, created in 1833 a magnetic observatory at Göttingen, and an association which extended over Europe, and invented most of the instruments now in use for magnetic investigations. His works, which cover the whole field of pure and applied mathematics,

have been collected in seven volumes. He died in 1855, and his centenary was celebrated at Brunswick in 1877.

Gautier, THÉOPHILE, was born at Tarbes in 1811. He passed from the public school of that town to the Collège Charlemagne in Paris, but won no distinctions. His first ambition was to become a painter, and it was probably under the influence of Gérard, Corot, and Borel, quite as much as of Gérard de Nerval, that he rushed into romanticism with the fervour of a neophyte. He was not long in discovering the real bent of his genius, and in 1830, after a few early efforts, brought out his first poem, *Albertus*. The *Comédie de la Mort* followed in 1832; but Gautier, who had meanwhile served Balzac as secretary, gradually found himself drawn more and more closely to prose as his best mode of utterance. A number of short stories were written by him about 1833, but these passed almost unnoticed until in 1835 *Mademoiselle de Maupin* marked its author as one of the greatest masters of French style. *Fortunio*, *Jettatura*, *La Morte Amoureuse*, *Une Larme du Diable*, *Militona*, *Spirite*, *Le Roman de la Momie*, and *Le Capitaine Fracasse*, are the best examples of his skill in fiction. He was, moreover, a great traveller within civilised limits, and his *Constantinople*, *Voyage en Russie*, *Voyage en Espagne*, *Caprices et Zigzags*, if not highly original, clothe the information of the guide-book in a very agreeable garb. His criticisms on art and literature, contributed chiefly to *La Presse* and *Le Moniteur*, deserve more attention than can be given them here, and will repay careful study. He returned now and again to verse, and the *Emaux et Camées*, first published in 1840, and reprinted with additions in 1872, contain some of the choicest lyrics that France can boast. *La Ménagerie Intime* and *Tableaux de Sièges* appeared just before his death in the latter year.

Gauze, a thin transparent fabric of silk, or silk and cotton. It is manufactured in large quantities in France and Switzerland, and in Great Britain at Glasgow, Paisley, and elsewhere. The threads of the warp are crossed between every thread of the weft, so as to form a series of loops. In this way each thread is kept in its place, while at the same time the texture is more loose and open than would otherwise be possible.

Gavarni, a pseudonym adopted by SULPICE PAUL GUILLAUME CHEVALIER, the famous French caricaturist, who was born in Paris of very humble parents in 1801. Starting in life as a workman in an engineer's factory, he cultivated during leisure moments his taste for figure-drawing, but it was not till his thirty-fourth year that he managed to get some of his sketches published by a journal of fashions. His talents soon became appreciated, and he was appointed editor of *Les Gens du Monde*, from which he passed to *Le Charivari* as a satirist of the men, women, and manners of contemporary France. His pencil found material in every social stratum. He was in great demand, too, as an illustrator of books, and *Le Juif Errant*, *Les Contes de Hoffmann*, *Les Physiologies* of Aubert, and an edition of Balzac's novels are among his chief efforts

in that line. Gavarni was also a man of scientific tastes, and before his death in 1866 sent several papers to the Académie des Sciences.

Gavazzi, FATHER ALESSANDRO, was born at Bologna in 1809, and, entering the Romish priesthood, joined the order of Barnabites, amongst whom he soon acquired reputation as a preacher. He was appointed Professor of Rhetoric at Naples, and on the accession of Pius IX. to the tiara in 1846, he actively supported the Pope's Liberal policy, and served as chaplain-general to the Roman legion sent to aid the Milanese. When the views of the Holy Father changed, he cast off his allegiance, and joined in the revolution of 1848. The French occupation of Rome compelled him to seek a refuge in England, and for some years he figured as an Anti-Popery lecturer in Great Britain and the United States. He also published his *Memoirs* and some of his *Orations*. In 1860 he took part with Garibaldi in his invasion of Sicily, and did not return to England until 1876, when he again lectured for the benefit of the Free Italian Church. He died in 1889.

Gavelkind, the common custom of the descent of land in Kent, almost the whole of which county was formerly subject to this tenure. Gavelkind before A.D. 1066 was the general custom of the realm; the feudal custom of primogeniture superseded it. It was retained in Kent, because, according to historical legend, the Kentish men surrounded William the Conqueror with a moving wood of boughs just after the slaughter at Hastings, and for that service obtained a confirmation of their ancient rights. The distinguishing properties of gavelkind are principally the following:—

1. The tenant is of age sufficient to alienate his estate by feoffment at the age of 15 years. [FEOFFMENT.]
2. The estate did not escheat in case of attainder for felony, the maxim being "the father to the bough, the son to the plough." [ATTAINDER.]
3. In most places where the tenure is gavelkind, the tenant always enjoyed the power of disposing of his lands and tenements by will.
4. The lands descend not to the eldest, youngest, or any one son only, but to all the sons together, which was anciently the usual course of descent all over England. [DESCENT.]
5. The wife is dowable of one-half instead of one-third of the lands, so long as she remains chaste and unmarried. [DOWER.]
6. The husband will be tenant by the curtesy, whether there be issue born or not, but only of one-half so long as he remains unmarried. [CURTESY, TENANT BY.]

These, among other properties, distinguish this, to us nowadays, remarkable tenure. By a statute of Henry VIII., certain lands in Kent are directed to be descendible for the future like other lands. This custom also prevails in some other parts of the country and in some copyhold manors. [COMMON LAW.]

Gavial. [GHARIAL.]

Gavotte, a dance resembling the minuet, introduced from France towards the end of the 17th century. In the course of 80 or 100 years it

became obsolete, and the name is now confined to the music intended to accompany it. This consists of 8 bars twice repeated, and opening with an up-beat. The time is *alla breve*.

Gay, JOHN, was born of a good family at Frithelstock, Devonshire, in 1688, but, losing his father early, was apprenticed to a silk-mercier in London. He disliked business, and abandoned it for literature. In 1710 appeared his first poem in serio-comic style, the subject being *Wine*. Two years later the Duchess of Monmouth engaged him as secretary, and in 1713 he published *Rural Sports*, which was dedicated to Pope, a life-long friend. *The Fan*, *The Wife of Bath*, a comedy, and *The Shepherd's Week* were produced in quick succession. In 1714 he held for a few months the post of secretary to Lord Clarendon, then ambassador at Hanover, but this was his last bit of official patronage. The *Trivia*, a very clever sketch of the London life of his day, added much to his reputation in 1716, but *Three Hours after Marriage*, a comedy in which Pope and Arbuthnot both lent a hand, proved an utter failure. A subscription for his collected poems and a gift of South Sea Stock from Secretary Craggs might have placed him beyond the reach of want, but he embarked in the prevailing speculations and was reduced to beggary. An illness ensued, from which he was rescued by the kindness of patrons and friends. In 1724 he brought out *The Captives*, a moderately successful tragedy, and in 1720 came the first volume of his celebrated *Fables*. *The Beggars' Opera* in 1727 proved a great hit, and replenished the author's exchequer, which was further swelled by the proceeds of another subscription, got up by the Duke and Duchess of Queensberry, whose house sheltered the poet till his death in 1732. His grave is in Westminster Abbey. The second instalment of his *Fables*, the *Distrest Wife*, and the *Rehearsal at Gotham* were published posthumously. *Polly*, a satirical opera, incurred the veto of the Lord Chamberlain; but, being printed, was one of Gay's most profitable ventures.

Gaya, a district and its capital in the Patna division of Bengal, British India. The former has an area of 4,718 square miles, and lies between Patna N., Monghyr E., Hazaribagh, S., and Shahabad W. The southern portion is hilly and woody, but towards the north the land slopes into a level and fertile plain, producing rice, wheat, oil-seeds, cotton, opium, indigo, and sugar. Saltpetre and timber are also exported. The climate is healthy, but subject to droughts. The Son is the chief river, and is navigable for small craft; the Pimpun, the Phalgu, and the Jumna are other streams. The population is chiefly Hindu, and the district is full of holy places, which maintain a lazy crew of priests called Gayawals. At Buddh Gaya the founder of Buddhism, Sakya Sinha, passed his period of contemplation under a fig-tree, and another centre of pilgrimages is found on the Baraba Hills. The town of Gaya is on the Phalgu, and is divided into two parts, one of which serves for the residence of merchants and strangers, whilst the other is occupied by the priests.

Gayal (*Bibos frontalis*), an Indian wild ox from the hill region east of the Brahmapootra. It is about the size of our English cattle, and there is a domesticated race.

Gay-Lussac, JOSEPH LOUIS, born at St. Léonard, Haute Vienne, France, in 1778, his father being a high legal official, was sent to the Ecole Polytechnique, where he showed so great an aptitude for physics and chemistry that Berthollet chose him to be his assistant. His first labours were directed to experiments on the dilatation of gases, and in 1804 he undertook two balloon ascents in order to obtain data as to terrestrial magnetism and the chemical constituents of the air. In 1805 and 1806 he accompanied A. von Humboldt in a tour through Switzerland, Italy, and Germany, returning to Paris just in time to secure his election to a vacancy in the Académie des Sciences. He next engaged with Thénard in investigating the properties of potassium, sodium, and boron, his discoveries being parallel to those of Davy, and in 1809 a similar honourable rivalry sprang up as regards the analysis of oxy-muriatic acid gas. In the same year he published the result of his observations as to the laws governing the combination of gases and the ratio borne by the volume of gaseous compounds to that of their primary elements. In 1811 appeared his *Récherches Physico-Chimiques*. This was followed by his important discoveries as to the constitution of hydrocyanic acid and the characteristics of iodine. The last part of his career was devoted to practical inquiries into such subjects as the bleaching action of chlorine, the assaying of precious metals, the processes of fermentation, and the manufacture of gunpowder. He lectured assiduously in various schools, and published his *Cours de Physique* and *Cours de Chimie*, working also with a number of private pupils, the most illustrious of whom was Liebig. He was made a peer of France in 1839. In lucidity, accuracy, and honesty, Gay-Lussac is surpassed by no other investigator. He died in 1850.

Gay-Lussac's Law, in *Heat*, is that the proportional increase in the volume of a gas under constant pressure from its volume at 0° C. is a constant multiple of its temperature. This multiple is known as the *coefficient of expansion* of the gas for constant pressure, and it is found by experiment to be about $\frac{1}{273}$ or .00367. The diminution in volume when cooled below 0° C. follows the same law for some time; if the law be supposed to hold good down to a temperature of -273° C., the volume must be regarded as zero.

Gaza (mod. *Ghazzeh*, Heb. *Azzah*, "strong"), an ancient Philistine city, 3 miles from the sea, and close to the S. boundary of the Holy Land, 50 miles S.W. of Jerusalem. It served as a barrier against attack from Egypt, and was frequently changing hands in the struggles between the Jews and their neighbours. Thus it happened that Samson was caught here, and released himself by carrying off the gates, and here, too, was the scene of his death. A tomb is still pointed out as his resting-place, but is, no doubt, apocryphal. The

modern town stands on an isolated hill, and has olive-gardens, palms, and some corn-fields in its neighbourhood. There are good bazaars, a large mosque built of ancient materials, and some pottery-works. Hashem, Mahomet's father, is buried here. The old port Limna Gaza, now El Mineh, is useless. Gaza was for many centuries the seat of a bishopric, and has a chariot-course and other traces of Græco-Latin civilisation.

Gazelle, any antelope of the genus *Gazella*, with seventeen species, ranging from North Africa eastwards to India, and having one representative in South Africa. They are small, lithe, and very active; the horns, which are smaller in the female, are black, strong, and lyrate; the fur is short and close-pressed, and there is usually a tuft of hair at the knee. The true gazelle (*Gazella dorcas*) ranges from North Africa into Persia, where also the larger form (*G. subgutturosa*) is found. It stands a little less than two feet high, and the body hair is rather coarse and of a pale fawn colour above, while the under surface is white. This species is often kept as a pet in the East, and references to it and to the beauty of its eyes are common in poetry. Authorities differ as to their habits: it is usually said that they live in large troops, and tales are told of the males forming a circle, with the does and fawns in the middle, and presenting a serried mass of horns to attacking lions or leopards. Blandford says that the true gazelle and Bennett's, or the Indian gazelle (*G. bennetti*) are generally met with singly, or in groups of from two to five, which, if correct, disposes of the circle story. Other species are the Arabian or Ariel gazelle (*G. ariel*), the Abyssinian (*G. sømmeringi*), the Korin (*G. rufifrons*), Grant's, or the East African gazelle (*G. granti*), and Speke's gazelle (*G. spekii*).

Gazetteer, a geographical or topographical dictionary, in which the names of places are arranged in alphabetical order, and statistical and other information is given concerning each. The word originally meant a writer in gazettes or newspapers—a sense which it retained in the 18th century. Its present meaning is due to the title of Laurence Echard's geographical dictionary of Europe, *The Gazetteer's or Newsman's Interpreter* (1703). In 1704 a second part was published, dealing with Asia, Africa, and America, in which the work is described as *The Gazetteer*.

Gean-tree. [CHERRY.]

Geary, SIR FRANCIS, BART., naval officer, born in 1709, became a captain in 1742. He was distinguished for the number, size, and value of his prizes; but he took part in no operation of importance until after his promotion to be rear-admiral in 1759. He was then employed under Hawke in watching the French fleet in Brest, and under Boscawen in watching the French fleet in Rochefort. In 1762 he became a vice-admiral, and in 1775 an admiral. In 1780 he took command of the Channel fleet, but ill-health compelled him to resign the post. He was rewarded in 1782 for his great, but unostentatious services with a baronetcy. He died in retirement in 1796.

Gebir or GEBER, the earliest of modern chemists, to whom are ascribed the treatises known as *Summa Perfectionis*, *Liber Investigationis*, *De Inventionem Veritatis*, *Liber Fornacum*, and *Testamentum*, besides a number of Arabic and Latin MSS., not as yet critically examined, is a personage of whom little is known for certain. Some look upon him as a myth; others describe him as a Sabæan of Harran in Mesopotamia, who flourished about the 10th century; others, again, make him a Greek or a Spaniard of much later date. As he is referred to by Arab writers of the 10th century, perhaps the correct view is that which identifies him with Abu Musa Dschabir Ben Haiyan, of Tarsus or Kufa, who died in 776 A.D. He held the theory prevalent among later alchemists that the metals are all identical in composition, and that by proper treatment they can be transmuted. He is also credited with a knowledge of corrosive sublimate, aqua fortis, nitrate of silver, etc. The writings ascribed to him have the merit of remarkable clearness and simplicity. By an absurd error he is sometimes spoken of as the inventor of Algebra.

Gecko, any individual of the family Geckotidæ, (wall-lizards), with 50 genera and 200 species widely distributed in the warmer parts of the globe. They are of small size (the largest being little over a foot in length, and the smallest about a quarter as much), with short, thick, fleshy tongue, stout limbs, and toes armed with claws and usually furnished below with adhesive discs or suckers, which enable these animals to run up walls and along ceilings, and to scramble with great rapidity over smooth rocks. The skin is loose and tubercled, and the colours are usually sombre, though some species are clad in blue, green, and red, the males being generally more brightly-hued than the females. They feed on insects and insect-larvæ, generally digging the latter out of holes and crevices. *Platydaetylus fascicularis*, the common wall-lizard, is abundant in Southern Europe. In some species, as in *Ptychozoon homaloccephalum*, the Flying Gecko, from Java, the limbs are connected by a membrane which forms a kind of parachute enabling the animal to take long leaps. The name Gecko is derived from a clicking sound made by dragging the glottis up to the palate. All the geckos have the undeserved reputation of being more or less poisonous.

Ged, WILLIAM, the inventor of stereotyping, was a native of Edinburgh. The date of his birth is uncertain; but in 1725 he first made known his method of printing from plates, and with the assistance of a capitalist started in business in London. He failed, and died broken-hearted in 1749, having produced two Prayer-Books for the University of Cambridge, and an edition of Sallust brought out at Edinburgh.

Geddes, ALEXANDER, was born at Ruthven, Banffshire, Scotland, in 1737. He entered a Scottish Roman Catholic seminary in 1753, and thence was sent to the Scottish College in Paris, where he acquired a sound knowledge of theology and of European languages. Returning to Scotland, he

held several cures, and became domestic chaplain to Lord Traquair, with whom he went to London in 1780, the University of Aberdeen having previously made him an honorary LL.D. He found a generous patron in Lord Petre, and after several preliminary publications he brought out, in 1792, the first volume of a new translation of the Vulgate. It exposed him to the attacks both of his own co-religionists and of Protestants, for it was undertaken in a liberal and scholarly spirit, with the assistance of philologists of various schools. The use of his book was vetoed, and he himself was inhibited. Nevertheless he persevered and in 1797 carried his task in a second volume to the end of the historical books, which he followed up in 1800 with *Critical Remarks on the Hebrew Scriptures*. He died in 1802.

Geelong, one of the chief towns of the colony of Victoria, Australia, situated on Corio Bay, 45 miles S. of Melbourne, having the Barwon river to the S. and the Bellarine Hills at the back. The town is well laid-out and very healthy. There are two parks, botanical gardens, and all the usual public institutions. The harbour is vast and deep, and the bar has been cut through at considerable expense so as to admit ships of the largest burthen. The export of wool is the chief source of prosperity; but there are extensive woollen-mills, tanneries, and paper-factories. Railways connect Geelong with every part of the colony.

Geez (pron. *Gaze*), the old Semitic language of Abyssinia, of which Tigré is the purest modern representative. It has long ceased to be spoken; but, like old Armenian and old Slavonic, it is still studied as the liturgical language of the Abyssinian Christians. Geez belongs to the Himyaritic or South Arabic division of the Semitic family, and preserves many archaic features of the organic Semitic tongue, which have been lost in the other members of the group. Thus of the fifteen primitive forms of the Semitic verb it retains no less than thirteen—that is, far more than does Arabic or any of the other cognate tongues. It is written in a peculiar syllabic alphabet running from left to right, and derived from the original writing system from which have sprung all the Semitic alphabets except the Assyrian cuneiforms. The Geez version of the Bible dates apparently from the 4th century, when Christianity was introduced into the Abyssinian highlands. Its literature also comprises numerous translations of Jewish, Greek, Christian and Arabic works. [HIMYARITIC, SEMITIC LANGUAGES.]

Gefle, a port at the head of the Gefleborglân on the coast of the Gulf of Bothnia, Sweden, halfway between Fahlun and Upsala. It stands upon two islands and upon both banks of the river that bears its name, the different quarters being connected by bridges. Its excellent harbour makes it only inferior to Stockholm and Gottenburg as a business centre, and its situation and features are very picturesque. The castle, the council-house, the free-masons' lodge, and other public buildings are worthy of note. Many fires have devastated the

town, which was almost destroyed by the last in 1869.

Gegenbaur, KARL, born in 1826 at Würzburg and educated at Jena, where he became a *privat-docent* and professor of anatomy, was appointed in 1873 to the chair of that science at Heidelberg. His contributions to the learned journals appeared early, and in 1876 he began to edit the *Morphological Year Book*. About this time appeared his *Outlines of Comparative Anatomy*, which was condensed in a still more valuable work published in 1878 and translated into English by Professor Ray Lankester and Mr. Jeffrey Bell. The *Textbook of Human Anatomy* was brought out in 1883.

Gehenna, the Greek form of the Hebrew *Gehinnom*, the name of the valley of Hinnom, a deep and narrow gorge on the south side of Jerusalem. When Ahab introduced the fire-god Moloch from Phœnicia, this valley became the scene of his worship, and here many infant sacrifices took place. Josiah, on restoring the religion of Jehovah, defiled the valley by scattering dead men's bones, after which it became a receptacle for all the filth of the city. This was partly consumed in fires which were always kept burning in the valley. All these associations may have contributed to the use of "Gehenna" in the New Testament in the sense of a place of torment after death.

Geibel, FRANZ EMMANUEL, was born in 1815 in the quaint old Hanseatic town of Lübeck, where he seems in his boyhood to have acquired a poetic bent. He began the study of theology at Bonn, but gave it up for the cult of the Muse. In 1838 Bettina von Arnim got him a tutorship in Greece, where he spent two years travelling, and returned in 1840 to bring out his first volume of poetry. He next resided at Cassel, and studied Spanish romance, his *König Roderick* being the fruit of this labour. The King of Prussia granted him a small pension, and in 1852 he was appointed Professor of Æsthetics in the university of Munich. He married, and lost his wife, an episode that has left an impress on his works. His Prussian sympathies led to his quitting Bavaria in 1868, and the rest of his life was passed at Lübeck, where he died in 1884, the victories of 1870 and the unification of Germany providing him with patriotic themes. Geibel's strength lay in lyrics, and some of his songs are almost national, such as *Der Arme Taugenichts*, *Der Zigeunerhube*, *Der Antwort*, *Der Mai ist Gekommen*, *Wenn Sich Zwei Herzen Scheiden*.

Geiger, ABRAHAM, the son of a rabbi, was born at Frankfort-on-the-Maine in 1810, and trained for his father's profession, following also the courses at Heidelberg and Bonn. He showed much ability, and wrote as a student valuable essays on the relations between Judaism and Mohammedanism. In 1832 he became Rabbi at Wiesbaden, and in 1838 was transferred to Breslau, where he spent twenty-five years of learned industry, producing his *Textbook on the Mishna*, *Studies from Maimonides*, and a treatise of high interest on the text and translation of the Bible as influencing the development of Judaism. His views brought him into conflict with

old-fashioned theologians. He was, however, made Rabbi at Frankfort in 1863, and thence chosen to the Chief Rabbinate of Berlin in 1870, dying there in 1874. Among his later works are *Pharisees and Sadducees*, *A History of Judaism*, and a Jewish prayer-book. His ephemeral publications on Semitic philology and historical and literary subjects were very numerous.

Geijer, or GEYER, ERIC GUSTAV, born in 1783 at Rarsäter, Sweden, was educated at Upsala, and went into the Record Office at Stockholm. He founded "The Gothic Society," and to its journal *Iduna* he contributed *The Viking*, the *Lost Skald*, and many other spirited patriotic poems, with many prose essays. In 1817 he was appointed professor of history at Upsala, and eight years later he completed the first volume of *Svea Rikes Hufder*, an able inquiry into legendary Swedish history. His great work, *Svenska Folkets Historia*, appeared between 1832 and 1836, but was never carried beyond the close of Christina's reign. His *Sketch of Sweden from the Death of Charles XII. to the Reign of Gustavus III.* comes next in importance. He retired from his professorship in 1846, and died next year at Stockholm.

Geikie, SIR ARCHIBALD, F.R.S., F.R.S.E., LL.D. St. Andrews and Edin., was born at Edinburgh in 1835, and appointed in 1855 to the Geological Survey, of which he became Director in 1881. Besides his official work and his lectures as professor of geology and mineralogy in the University of Edinburgh, he is the author of many books, some technical, others popular. The chief of these are *The Story of a Boulder* (1858), *The Life of Professor Edward Forbes* (1861), *The Phenomena of the Glacial Drift in Scotland* (1863), *The Scenery of Scotland Viewed in Connection with its Physical Geology*, *A Memoir of Sir Roderick Murchison*.

Geikie, PROFESSOR JAMES, LL.D., D.C.L., brother of the foregoing, was born in 1839, and also found employment in the Survey, which he left to succeed Archibald as professor at Edinburgh. His best-known works are *The Great Ice Age*, *Prehistoric Europe*, and *Outlines of Geology*.

Geiler, or GEYLER VON KAISERSBERG, JOHANN, was born at Schaffhausen in 1445, but passed his infancy at the place in Alsace from which he got his second name. He studied at Freiburg, where he afterwards became professor, and at Basel; but his true vocation was preaching, and in 1478 he accepted a call to the cathedral of Strasbourg, where he remained until his death in 1510.

Geissler's Apparatus, a small and compact form of apparatus used in chemical analysis for the speedy determination of carbonic acid in carbonates, the latter being decomposed and estimated by the loss of weight owing to the carbonic acid gas, CO_2 , evolved. Various modifications of Geissler's original form are also used for the same purpose.

Geissler Tubes. [VACUUM TUBES.]

Gelada (*Theropithecus gelada* = *Gelada rüppellii*), an Abyssinian baboon, about two feet long, dark-brown in colour, and heavily maned. It is sometimes seen in confinement. [BABOON.]

Gelasius I. succeeded Felix III. as Pope in 492. He widened the breach between the Eastern and Western Churches by his quarrel with Acacius, the Patriarch of Constantinople, and he also asserted his superiority over the Emperors and the General Councils. He died in 496, and was canonised. GELASIUS II. was the successor to Pascal II. in 1118, the Emperor Henry V. opposing his election. Cencio di Frangipani seized him, but a popular rising led to his release. He had, however, to leave Rome, and Maurice Bourdin was put into his place under the title of Gregory VIII. Gelasius excommunicated his rival at a council held at Capua, and secretly returned to Rome. He was soon driven into exile, and died in 1119 at the Abbey of Cluny in France.

Gelatine. That a substance, the solution of which possesses the property of setting to a jelly-like mass, could be obtained from animal products, has been known from comparatively early times. Few early details of it, however, are existent. It is at present chiefly prepared from the hides, sinews, bones, hoofs, horns, etc., of various animals by the action of hot water or steam, or a mixture of both. The various processes employed vary somewhat in their details, but the following may be regarded as typical:—The hide, etc., is cut or broken up into small pieces, which are digested for some days with a weak soda solution at a temperature of about 60° to 70° Fahr. They are then placed in an air-tight chamber until quite soft, and are afterwards washed by cold water in a revolving cylinder. After bleaching, which is effected by means of sulphur dioxide, SO_2 , they are well pressed and are thoroughly digested with hot water until as much as possible is dissolved out. The resulting liquor is strained and allowed to set upon slate or marble slabs. The crude gelatine is then cut up into strips and purified by redissolving, again straining, and allowing to cool. Pure gelatine is a hard, tough, transparent, tasteless, and inodorous substance. In dry air it remains unchanged, but if exposed to moisture it decomposes and putrefies, becoming at first slightly acid, but then alkaline, owing to the formation of ammonia. If heated, it clears and evolves fumes with a very pungent odour. Its composition varies with the source and manufacture, but generally approximates to carbon 50, oxygen 25, nitrogen 18, hydrogen 7 per cent., and frequently also contains small quantities of sulphur. No satisfactory formula representing the composition has been forthcoming. It is heavier than water, and if placed in cold water it swells considerably, absorbing from 5 to 10 times its weight of the liquid, and at about 85° Fahr. (30° C.) it dissolves in the absorbed water. If hot water be employed for its solution, a liquid is obtained, which sets on cooling if the quantity of gelatine present is not less than 1 part to 100 of water. It is insoluble in dilute acids and alkalis, but in strong acids it generally dissolves or decomposes. It is

precipitated from its solutions by tannic acid. 1 part in 5,000 of water being detectable by this means. When used as an article of food, the gelatine should be pure and carefully manufactured; its value for this purpose, however, appears to be much exaggerated in popular opinion. Isinglass (q.v.) and glue (q.v.) are respectively pure and impure forms of gelatine. It finds much employment in the arts and for manufacturing purposes. Thus, in photography it is very extensively used, as for the preparation of dry plates [GELATINO-BROMIDE], and in various printing processes. It is also employed largely in the dyeing industry, in electrotyping, waterproofing, in the manufacture of printing ink, etc., while it finds applications for many purely scientific purposes—*e.g.* bacteria culture [BACTERIA]—and, in the household, is used largely for making jellies and various culinary mysteries.

Gelatine Dynamite, one of the nitroglycerine explosives, resembles blasting gelatine (q.v.), and occupies a place midway between it and dynamite. It consists of thin blasting gelatine mixed with other substances, as, for example, cotton, charcoal, nitrates, etc.

Gelatino-bromide, the "dry plates" used so extensively in photography for the production of "negatives," "transparencies," "lantern-slides," etc., are prepared by coating glass with a stratum of gelatine, containing suspended through it a quantity of sensitive silver salts. The *bromide of silver*, AgBr, is that most extensively employed, and the plates are then known as gelatino-bromide. The first step for their manufacture is the preparation of the "gelatine emulsion." To effect this about 270 parts of good gelatine, which should be neither too hard nor too soft, is dissolved in hot water, and to this is added a solution of silver nitrate. 175 parts, in a little water, the liquid being well shaken, and when thoroughly mixed a solution of potassium bromide (KBr), 135 parts, and potassium iodide (KI), 5 parts, is slowly added with frequent shaking. The whole is then placed in a vessel surrounded by boiling water, and kept for about an hour. It is then allowed to cool, strained by squeezing through coarse muslin, well washed with water, and thoroughly drained. To coat the plate the gelatine is liquefied by warming, and a little is poured on the centre of the glass plate, which should be perfectly clean and level. By gently rocking the plate an even layer over the whole surface is obtained, but in the manufactory, where large numbers are made, various artifices are employed to secure an even coating. The plate is allowed to cool that the gelatine may set, and is then ready for use. Paper may be coated with a gelatino-bromide emulsion in a similar manner, and used either for the production of "positives"—*e.g.* the well-known "bromide-papers"—or, after rendering the paper transparent, for the production of negatives, forming different varieties of "films" (q.v.). For some purposes potassium chloride is substituted for bromide in the manufacture of the emulsion, and the resulting plates or papers are known as *gelatino-chloride*. They are not as sensitive to light as the bromide preparation, and hence require longer

exposure in the camera or when printing. It is needless to state that all the manipulations of the preparation, etc., should be performed in yellow or red light only.

Gell, SIR WILLIAM, KNT., was born at Hopton, Derbyshire, in 1777. He took his degree at Cambridge, and became a fellow of Emmanuel College. Being sent on a diplomatic mission to Greece he found ample opportunities for antiquarian researches, and on his return published his *Topography of Troy* and *Geography and Antiquities of Ithaca* (1807). His *Itinerary of Greece* appeared in 1810, and his *Itinerary of the Morea* six years later. *Pompeiana*, his most valuable work, was brought out between 1817 and 1831, and in 1834 was followed by *The Topography of Rome*. He died at Naples in 1836.

Gellert, CHRISTIAN FÜRCHTEGOTT, born at Hainichen, Saxony, in 1715, and educated at the university of Leipsic, obtained a professorship of philosophy there and held it till his death in 1769. Gellert was the author of a volume of *Fables and Tales*, and of a collection of moral and sacred poetry, both conceived in a spirit of simple and natural piety. His comedies, pastorals, and one romance are not of any considerable merit.

Gellius, AULUS, is known to us only by his curious commonplace-book entitled *Noctes Attice*. He must have flourished in the 2nd century A.D., probably from 120 to 180, and appears to have studied in Athens and held subsequently some judicial office in Rome. His work, begun to while away the winter nights in Greece, was continued through many years, and consists of an undigested mass of notes on every conceivable topic, interlarded with extracts from authors, many of whom would be otherwise unknown.

Gelon I., son of Dinomenes, after serving as a soldier under Hippocrates, tyrant of Gela, in Sicily, succeeded that monarch in 491 B.C. He then made himself master also of Syracuse by adopting the cause of the plebs, and he used his power so as to add immensely to the importance of the State. In 480 he defeated Hamilcar at Himera, on the same day, it is said, that the battle of Salamis was won by the Greeks. Before his death in 478 Sicily was virtually subject to him, and his memory was so respected that, when all memorials of tyranny were being swept away, his statues remained intact. **GELON II.**, son and colleague of Hiero II., of Syracuse, was born about 266 B.C. He was a patron of Archimedes and an ally of Rome, but after the disaster at Cannæ he is reported to have contemplated abandoning the alliance when he died in 216. He left a son, Hieronymus, and his father survived him.

Gemmation, the method of reproduction by the formation of buds, which may be separated as independent individuals as in the *Hydra*, or remain connected with the parent as in the compound corals.

Gemmi Pass, a picturesque and much-frequented Alpine road, 24 miles S. of Thun, connecting the cantons of Valais and Berne. From

the baths of Leuk the road is hewn out of the solid rock, and attains a height of 7,160 feet above sea-level.

Gemmules, a special method of gemmation which occurs in some sponges such as *Spongilla* (the common fresh-water sponge) and *Tethya*. They are groups of cells, sometimes protected by a layer of spicules, which are separated from the parent.

Gems, stones of exceptional beauty and value. In archæology the term is applied to engraved precious stones, used for sealing or as a personal ornament, or applied to decorative purposes. Signet-rings became general among the Greeks and Romans, but apparently sealing was not the purpose for which gems were originally worn. The art of gem-engraving was carried by the ancients to a degree of perfection which no subsequent efforts have reached. It is doubtful whether it originated in Egypt or Assyria. From the harder quality of the stones used in Egyptian art, it may be inferred that it would more naturally spring up there, but the early use of soft stones and simple instruments points rather to Assyria. The gems of the two peoples have not much in common. The earliest found in Assyria are cylindrical in form, bored through their length to admit a cord, by which they were fastened to the wrist. Babylonian gems resemble the Assyrian, but in Persia, where chalcedony was the favourite material, a conical shape was afterwards substituted, and the design was engraved on the base. The Egyptian gems are mostly scarabs, and the same form predominated among the Etruscans, where the art was in a very flourishing condition in the 3rd century B.C. The first Greek artist whose name is recorded is Theodorus of Samos, who engraved the emerald in the ring of Polycrates; but it is doubtful whether any genuine intaglios now existing can be referred to an earlier period than the Peloponnesian War. Greece afterwards produced many famous engravers, including Pyrgoteles, who was employed by Alexander the Great. Sard, jacinth, and amethysts were the stones most used. The engravings represent mythological and heroical subjects, as well as portraits of deities, kings, and historical characters. The art of engraving in cameo—a species of relief executed in stones consisting of differently coloured layers—seems to have been introduced under Alexander's successors. As the fragments of Alexander's empire were successively conquered by the Romans, they became acquainted with gem-engraving, which was henceforward practised at Rome, reaching its highest development there during the period of the early emperors. Among artists of this age Dioscorides, who lived in the time of Augustus, holds the first place. Pliny gives an exhaustive list of stones used by the Romans. Very hard and valuable stones, such as the diamond, sapphire, and ruby, seem to have been seldom engraved. The sardonyx was especially adapted to cameos, on account of its fourfold variety of colour—blue, black, white, and red. The other stones used included the emerald, sard, beryl, amethyst, onyx, jacinth, topaz, opal, and garnet. The engravings

on Roman gems resemble the Greek in their general character. After the 2nd century A.D. the art gradually declined, and appears to have been almost, if not completely, lost during the Middle Ages. At the close of the 15th century it was revived by Lorenzo de' Medici, and flourished in Italy for about a hundred years. In the 17th century it was cultivated with much success in Germany and France, and since then there have been many skilful engravers in all the chief countries of Europe. The attempt to manufacture artificial gems, which dates from the discovery of the chemical composition of precious stones, has met with considerable success during recent years.

Gemsbok (*Oryx gazella*), a large South African antelope, with long, straight, obscurely-ringed horns, abundant in the Kalahari desert. The hair is fawn or yellowish above and white below, the coloration being separated by an irregular black band, and there are markings of the same colour on the face and limbs. It is fierce in disposition, and is said to be able to beat off the lion with its long horns. [ORYX.]

Gendarmes (French, "men-at-arms"), originally a body of French cavalry, first enrolled in the reign of Charles VII. The name has been transferred to the French police force, which dates from the year 1790. The gendarmerie forms a part of the regular army, and includes both mounted and unmounted soldiers, usually selected from other corps on account of their superior character and ability.

Gender, a distinction between words based on the difference between the sexes. Grammarians recognise three genders—masculine, feminine, and neuter—though the neuter is not really a gender, since it merely denotes that a word is *neither* masculine nor feminine. The fact that in ancient languages many lifeless objects are masculine or feminine instead of neuter may perhaps be attributed to the primitive view of the universe, which endowed all things with personality and consciousness. Then, later, words acquired a gender on account of the similarity of their endings to words already in existence. There is no neuter in Semitic languages, and it has disappeared in the Romance languages—words originally neuter having become masculine or feminine—but it remains in German and various other Aryan tongues. In English gender survives only in the personal pronouns (*he, she, it*, etc.), and a few other ancient forms.

General, in the Roman Catholic Church, the head of the various communities forming a religious order. The general of an order is answerable to the Pope alone, being free from episcopal control. Next in rank to the general are the provincials (q.v.), and below these are the heads of separate institutions as abbots, priors, etc. The general is usually elected for a term of three years, but in the case of the Jesuits for life. The elective body is the general chapter, commonly composed of the provincials and some of the chief heads of houses. An election is not valid till it receives the Pope's assent. The general lives at Rome, where he takes

part in general councils. He sends out visitors to inquire into local abuses and disputes, and holds a general chapter at certain fixed intervals.

General Average is the share paid by each party interested in any maritime venture for any expenses that have been voluntarily incurred for the advantage of the parties involved. Part of the cargo or part of the ship itself may be sacrificed for the sake of the remainder, and if this loss be not due to imperfect stowage or to fault of the master it is recovered by the general average. The settlement of this average is often a question of much complexity, and is arranged by special accountants known as *average adjusters*. Difficulties occur in the lack of agreement between the codes of rules adopted in the different countries, but the York-Antwerp code formed in 1877 is being gradually adopted, by reason of its special mention in bills of lading and insurance policies. [PARTICULAR AVERAGE.]

Genesee, a river which rises in Pennsylvania in the same spot as the Susquehanna and Alleghany, and flowing through New York State, where it gives its name to a county and township, discharges itself after a course of 153 miles into Lake Ontario. At Rochester it falls 226 feet in a few miles, but is navigable for small craft above and below that point. A county in Michigan also bears this name.

Genesis (abbreviated form of *genesis kosmon*, "origin of the world"), the word used in the Septuagint to translate the Hebrew *Bereshith*, the name of the first book of the Pentateuch. Genesis, like the rest of the Pentateuch, is written on a clearly-conceived plan--viz. to show how God chose out a people sacred to Himself, and to narrate the circumstances which preceded and attended that manifestation of the Divine Will. First among these, in order of time, was the creation of the human race itself and the place of its habitation. As the history advances, its scope gradually becomes narrower, everything being left on one side which has no direct bearing on the writer's main purpose. The narrative moves forward rapidly till we reach the call of Abraham, which may be regarded as the central point of the book, as the giving of the law on Sinai is of the whole Pentateuch. From this point onwards we have a detailed account of the lives of the Hebrew patriarchs, in regular order from father to son, and the style at the same time becomes more lively and flowing. The theory, however, that the book resulted from a compilation of older documents, first propounded by the Belgian physician, Astruc (1753), is now accepted by many competent Biblical scholars. The number of documents is disputed, but one can trace at least two, distinguished by the names they respectively assign to the Almighty--*Elohim* and *Jehova*. It is generally held that the "Jehovist" incorporated in his own work that of an earlier "Elohist." The "Jehovist" was probably Moses, but others refer the composition of the book to a much later period.

Genette, GENET, a genus of Viverridæ, with five species from Africa and Western Asia, one

(*G. vulgaris*) ranging into Southern Europe, where it is sometimes domesticated as a mouser. The genettes are smaller than civets (q.v.), and have retractile claws, and the anal pouches very small and without perceptible secretion. The fur is grey with dark round or oblong patches.

Geneva (Fr. *Genève*; Ger. *Genf*; Ital. *Ginevra*), a walled town, capital of the canton of the same name in Switzerland, is situated at the point where the Rhône issues from the S.W. extremity of the Lake of Geneva. An *oppidum* and a bridge existed here in Cæsar's time, and the inhabitants were Celtic Allobroges, but across the river dwelt Helvetii. It is conjectured that the site was in prehistoric times occupied by a group of lacustrine dwellings, but the depth of alluvium conceals all traces of such structures. Till the end of the 4th century of our era Geneva was more or less subject to Rome. It then passed to the Burgundians, and became in 534 part of the kingdom of the Franks. For two centuries or more the chief authority rested with the bishops under the protection of the Emperors, of the Kings of Burgundy, or the Counts of the Genevois. Calvin saved his countrymen from Catholic domination at the cost, no doubt, of some sacrifice of freedom in opinion, but after his death democracy again asserted itself, and was then opposed by internal oligarchy. Even the temporary annexation by the French Republic in 1798 failed to establish a solid democratic constitution. The older and wealthier families still monopolised the conduct of affairs. Geneva is divided into two by the Rhône, which is traversed by five bridges, and has a small port upon the lake. Commanding a view of Mont Blanc to the S. and of the Jura to the N.W., it is well placed, though the actual site is somewhat flat and uninteresting. The old town clusters round the cathedral, a half-Gothic, half-Romanesque structure of the 12th and 13th centuries with incongruous additions. It is small, contains some fifteenth-century glass, a few sepulchral monuments, and the remains of the old stalls. The town-hall dates from the 15th century, but the existing fabric is more modern, and possesses little interest save as having been the scene of the *Alabama* Conference in 1872. The court-house is a good specimen of the Mansard style, and the arsenal deserves notice. Among modern buildings the most important are the Athénée, the Rath Museum, the Fol Museum, the Conservatorium, the electoral Palace, the University, the Hall of the Reformation, and the Russian church. Railway communications make the place easy of access from all parts of Switzerland, from France, Italy, and Germany. Steamboats ply constantly to the various ports on the lake. The chief trades are watchmaking, the manufacture of musical-boxes and scientific instruments, silks, calicoes, and chemicals, printing, and wood-carving. To political and religious refugees of all sorts Geneva has been a sanctuary for many years.

Geneva, THE LAKE OF, or LAKE LEMAN (classic *Lacus Lemanus*), lies between Switzerland and the department of Haute Savoie, France, extending in a crescent shape from E. to W. for a total length of 53 miles, with a mean breadth of

6 miles, a superficial area of 223 square miles, and a level of 1,230 feet above the sea. The W. extremity narrows suddenly to some two miles from the strait of Promonthoux, and this part, about 14 miles long, is sometimes called "The Little Lake." The greatest depth (1,095 feet) is attained between Evian and Ouchy. The water is remarkable for its blue colour, and is liable to rather peculiar movements, called *seiches*, which cause a rise of as much as four feet first on one shore, then on the other. There are also local winds—*e.g.* the Bise from N.E., the Bornaud from the Savoy valleys, and the dry Séchard from S. Besides the Rhône, which enters near Villeneuve at the E. end and issues at Geneva, the lake receives several small rivers as the Dranse and the Venoge. Fish are not very abundant, but the fresh-water fauna at the lowest depths possesses considerable interest. It is never wholly frozen over. The shores are undulating, well-wooded, and fertile on the N., but more boldly picturesque and less cultivated on the S. Nyon, Rolle, Morges, Ouchy, Lausanne, Vevey, Montreux, and Clarens (the scene of Rousseau's romance) are the chief spots on the Swiss littoral. Evian, Thonon, and Ferney (Voltaire's residence) are the only places of interest on the French side.

Geneva, THE CANTON OF, the smallest of Swiss cantons, has an area of 108 square miles, being bounded S.W. by the French departments of Haute Savoie and Ain, N. by the canton of Vaud, and E. by the Lake of Geneva. The surface is undulating but not mountainous, and the soil is highly cultivated, yielding cereals, fruit, and wine. Building stone and bituminous shale are the only mineral products. The city of Geneva makes the density of the population considerable. French is the prevailing language, but a German element is gradually growing stronger.

Geneviève, or GENOVEFA, the patron saint of Paris, was born about 425 A.D., probably at Nanterre. She is reported to have entered upon the religious life at the age of seven under the influence of St. Germain d'Auxerre. She acquired high repute for piety and austerity, and also for prophetic power, which enabled her to predict Attila's invasion and retreat. In 460 she built the first church over the remains of St. Denis, and at her death towards the beginning of the next century the fane of Ste.-Geneviève, afterwards merged in the Panthéon, was raised over her grave. Her day is kept on January 3. In the 17th century religious orders for both sexes were established in her name. The *filles de Ste.-Geneviève* have more recently been known as *Miramiones*, and devote themselves to nursing and teaching.

Genghis Khan, also written JENGHIS or ZINGIS KHAN, a Mongolian prince, was born about 1160, and succeeded to the throne at the age of thirteen. His early years were spent in petty wars against local tribes, but in 1206 he invaded China, and breached the Great Wall. He renewed his attack twelve years later, stormed Peking, and ultimately established his supremacy over the northern provinces, adding Eastern Persia, Samarcand,

Bokhara, and all Tartary to his dominions. It is computed that his conquests cost the lives of five millions of men. One of his most famous battles was fought in 1225 on the frozen lake of Koko Nor after a winter march across the Desert of Gobi. He then penetrated farther into China, and stormed Nankin. His empire extended from the banks of the Dnieper to the China Sea. He died on the march in 1227 near the banks of the river Sale, and his vast dominions were divided between his four sons. Though as cruel and unscrupulous as most conquerors, Genghis possessed some good qualities. He drew up a code, which still prevails; he showed religious toleration; and to his soldiers and his trusted friends he was just and generous.

Genista, a genus of leguminous plants, comprising about 100 species of small branching shrubs from one foot to six feet in height and often spinous, which are natives of Western Asia, Europe, and North Africa. They bear simple or trifoliate leaves with minute stipules or exstipulate, and their flowers are yellow and in racemes. The bilabiate calyx is five-toothed: the keel petals of the papilionaceous corolla are deflexed after flowering; and the ten stamens are all united below, and are alternately short with versatile, and long with basifixed anthers. There are three British species: the spinous Petty Whin or Needle Greenweed, *G. anglica*; the rare *G. pilosa*; and the Woadwaxen or Dyer's Greenweed, *G. tinctoria*, the *plante genêt* from which the royal family of Plantagenet derived their name and badge. The latter plant was formerly used to give a yellow dye, which, on the addition of the blue woad (q.v.), yielded Kendal green.

Genius, the name given by the Italian races to the protecting spirit or tutelary deity of a person, place, or thing. Every individual was supposed to have a genius (*genius natalis*), a spiritual second self, who influenced his conduct and fate. Later, an evil genius was also imagined, and a man's good and bad actions were attributed to his good and evil genius respectively. From this pagan notion was developed the idea that every person has a guardian angel. [DEMONOLOGY, FAMILIAR, JINN, NEO-PLATONISM.]

Genlis, STEPHANIE FÉLICITÉ, COMTESSE DE, was born at Champéry, near Autun, Burgundy, in 1746. She received a good education, and in 1761 married Comte Bruslart de Genlis, afterwards Marquis de Sillery, who perished a victim of the Revolution in 1793. Her aunt, Madame de Montesson, having secretly married the Duc d'Orléans, had her appointed governess to her husband's children, one of whom was the future Louis Philippe. She began early to write on educational and moral subjects, and no fewer than ninety works came from her pen. Chief among these are *Le Théâtre de l'Éducation*, *Annales de Vertu*, *Lettres sur l'Éducation*, *Les Veillées du Château*, *Les Petits Émigrés*, and a number of historical romances. In 1792 she went into exile, but returned to receive a pension from Napoleon, which was continued by the Orleanist princes after the Restoration. She died in 1830, leaving several volumes of *Mémoires*.

Genoa (classic *Genua*; Ital. *Genova*; Fr. *Gênes*), a walled city and seaport at the head of the Gulf of Genoa in the Mediterranean, 79 miles S.E. of Turin, and capital of the province which bears its name. A place of importance as early as the second Punic War, it became, at the close of the dark ages and the struggle against the Moslems, the head of a powerful commercial republic, which rivalled Venice and maintained its independence from the 11th to the 18th century. In 1797 it was incorporated by France with the Ligurian Republic, and in 1815 was ceded by the Peace of Paris to Sardinia, an act which was for many years deeply resented by the inhabitants, who were stimulated by Mazzini to an ineffectual revolt in 1850. The narrowness of the foreshore has compelled the city in its growth to climb the steep flanks of the Ligurian Alps, and the aspect of its marble palaces, churches, and thickly-crowded houses, piled one above the other over the crescent-shaped harbour, quite justifies its assumption of the epithet "Superb." The walls have from time to time enlarged their circuit, and have now a sweep of some dozen miles. Scattered among the streets are the grand palaces of the old merchant-princes, the Doria-Pamfili, the Brignolo, the Durazzo, the Balbi, the Pallavicini, and many others, some of which are now public offices, others being museums of art. The cathedral, dedicated to St. Lawrence, dates back to the 9th century; but the existing structure with its Saraceno-Gothic features is two centuries later, and much of the external architecture and internal decoration belongs to a more recent period. Other churches of interest are St. Ambrose and St. Philip, the Annunziata, Santa Maria delle Vigne with its campanile, San Siro, and Santa Maria di Carignano, many of which possess fine pictures. The harbour, protected by two moles, is semicircular, having a radius of $\frac{3}{4}$ mile. Lines of steamers afford communication with every quarter of the world, and the railway system now brings the town into connection with the whole of France and Italy. Genoa possesses an archbishopric, a university, a complete educational organisation, a naval school, an academy, libraries, and very wealthy charitable institutions.

Genre (Latin *genus*, "kind"), a "kind" of painting, in which domestic interiors, rustic festivals, and similar scenes are represented. Human figures are an essential characteristic of *genre*, and these must be types of a class, not real characters as in historical pictures. The present style of *genre*-painting arose in the Netherlands in the 16th century. In France the term has a wider significance, being used to classify the various kinds of painting, as *genre du paysage* (landscape), *genre historique*, etc.

Genseric, King of the Vandals, was born at Seville about 406 A.D. He was chosen to succeed his elder brother in 427. On the invitation of the rebel general Boniface, he attacked the African colonies of Rome in 429, and compelled the emperor to surrender to him Western Numidia and Mauretania. Eudocia in 455 begged him to take vengeance on Maximus for the murder of Valentinian, and he stormed and sacked Rome, carrying off the empress

and her daughter as prisoners. Neither Majorian nor Leo was successful in their attempts to punish the barbarian, who pushed his conquests from Sicily to Corsica and from Thrace to Asia Minor and Egypt. He died in 477, and his dominions were to some extent dismembered by Belisarius.

Gentian, the name of a genus of gamopetalous, herbaceous plants, comprising about 150 species and forming the type of the order *Gentianaceæ*. They are perennial plants with apposite, decussate, simple, sessile, and entire leaves and cymosely-grouped, polysymmetric, tetramerous, or pentamerous flowers. The calyx is valvate, and the corolla contorted in the bud; the stamens form one whorl, and are epipetalous and included; and the two carpels unite in a one-chambered, many-seeded ovary with two stigmas, which gives rise to a capsular fruit. The corolla is commonly a deep blue, such species occurring at an altitude of 16,000 feet in the Himalayas; red flowers are almost confined to the Andean forms; and white and yellow also occur. They belong mostly to hilly or mountainous situations in the temperate regions of the northern hemisphere. Five species are natives of the British Isles. [GENTISIN.]

Gentianin. [GENTISIN.]

Gentiles, in the Old Testament, translates a Hebrew word, meaning "foreigners" as opposed to Israelites. In the New Testament it is used to translate two Greek words, *ethne*, "nations," corresponding to the Hebrew word mentioned above, and *Hellenes*, literally "Greeks" (as in Romans ii. 9, 10, etc.). Most of the foreigners with whom the apostles came in contact spoke Greek.

Gentio-picrin. [GENTISIN.]

Gentisin, a yellow crystalline substance of composition represented by $C_{10}H_{14}O_5$, which occurs in gentian root. From this source it may be obtained by (1) maceration with cold water, and then (2) extracting with hot alcohol. It forms large yellow needles, melting at 203° , insoluble in water but soluble in alcohol and alkalies. It was formerly much confused with another constituent of the root—*gentio-picrin*, $C_{20}H_{30}O_{12}$, to which the root owes its medicinal properties—both being called *gentianin*.

Gentleman seems to have been always used in a vaguer and more general sense than Esquire to denote one whose birth, wealth, or good breeding gave him a superior social position. There remain "titles of gentility" granted by Richard II. and Henry VI., but these apparently conferred the rank of Esquire. The name could be applied to anyone above the rank of yeoman, and there is no ground for supposing that it ever had any more definite and restricted meaning. As now employed, it usually implies both that the individual described is more or less refined, and that his parents occupied a certain position in society, but it is sometimes used to convey only one of these two notions.

Gentlemen-at-Arms, a royal body-guard established by Henry VIII. in 1509, and originally

entitled "gentlemen pensioners." The corps consists of a captain, a lieutenant, a standard-bearer, a clerk of the cheque, and forty gentlemen, all in receipt of a salary. Commissions are given by the Crown, on the recommendation of the commander-in-chief, as a reward for distinguished military service. Gentlemen-at-arms still attend the sovereign on certain solemn and festive occasions.

Gentoo (Portuguese *gentio*, a "Gentile" or heathen), a term formerly applied in a vague way to the pagan inhabitants of the Indian seaboard, and then more particularly to the Telugu people of Madras. The expression "Gentoo language" was always understood to refer to the Telugu, which is a chief member of the Dravidian linguistic family. [DRAVIDIAN.] In Jagor and Koerbin's lists there is a low-caste Madras tribe still specially known by this name.

Gentz, FRIEDRICH VON, the son of a Prussian official, was born at Breslau in 1764. He held for a time a post under the Prussian Government with the rank of Kriegersath. His sympathies with the French Revolution were counteracted by Burke's *Reflections*, which he translated into German. Visiting England at the end of the century, he made the friendship of Mackintosh. He now became a professional political writer, having apparently no convictions, but being ready to serve any party with his pen. He steadily opposed, however, the spread of the Revolution and the rise of Napoleon. In 1802 he transferred himself to Vienna, accompanied Castlereagh to the Conference there, and was present at all the subsequent congresses. He died in 1832.

Genuflexion, the act of bending the knees in worship, as a token of submission or penitence.

Genus, in *Biology*, denotes a group of species of animals or plants, possessing common essential details of structure. A genus may consist of a single species or of very many; in the latter case it is usually divided into sub-genera. The scientific name of every organism in the binomial nomenclature of Linnæus consists of two parts: the first generic, the second specific—*e.g.* *Felis leo*, the lion; *Felis tigris*, the tiger.

Geocentric, in *Astronomy*, refers to those motions which have the earth for centre, or which are measured in relation to the earth. Thus, the motion of the moon in a slightly elliptical orbit round the earth at one focus is called geocentric. The geocentric latitude of a planet is the angle made by the line joining it to the earth with the plane of the ecliptic. The geocentric longitude is the angular distance of the planet measured along the line of the ecliptic from a certain standard point, known as the first point in Aries.

Geode, or POTATO-STONE, a bubble of quartz forming a hollow, rounded body, often several inches in diameter, and generally lined with crystals. Externally geodes often resemble potatoes. They have originated in igneous rocks, and seem to represent the initial stage in the formation of agates (q.v.).

Geodesy is the science of measuring lines and areas on the surface of the earth. It is effected by means of triangulation (q.v.), and requires for great lengths or areas a knowledge of certain rules in spherical trigonometry. It is required in the determination of the dimensions of the earth and in the preparation of maps.

Geoffrey of Monmouth, an ecclesiastic who flourished in the first half of the 12th century, dying as Bishop of St. Asaph in 1154. He is the author of the *Chronicon sive Historia Britonum*, the two other works attributed to him being spurious. He professes to have translated this curious record from the Breton, but there can be no doubt that this statement is false. The book is compiled from Gildas, Nennius, Virgil, and other early authors, with a number of current legends thrown in, the whole being dressed up by a vivid and unscrupulous imagination.

Geoffrey IV., Duke of Anjou, known as Plantagenet from his adoption of the *genista* or broom as his badge, was born in 1113. He married Maud, daughter of Henry I. of England and widow of the Emperor Henry V. He maintained a long and fruitless struggle with Stephen for the possession of Normandy, but his son Henry founded the Plantagenet dynasty in England. Geoffrey died in 1150 on his return from the crusade in which he had joined Louis VII.

Geoffrey II., Duke of Brittany, third son of Henry II. of England and Eleanor of Guienne. He married Constance, daughter of Conan, Duke of Brittany, and with Henry II.'s aid usurped his father-in-law's throne. He was killed at the age of 28 in a tournament at Paris (1186), and left the ill-starred Prince Arthur, who was put to death by King John.

Geoffrin, MADAME THÉRÈSE RODET, the daughter of a *valet-de-chambre* at the French Court, was born in 1699. She married a rich glass-maker, who left her a widow. Her wealth was mainly devoted to encouraging literature, and her salon was frequented by Diderot, Marmontel, D'Alembert, Walpole, Gibbon, and Hume. The *Encyclopédie* was largely subsidised by her. She was invited by Stanislas to Warsaw, and was received by Maria Theresa at Vienna. She died in 1777.

Geoffroy St. Hilaire, ÉTIENNE, was born at Étampes in 1772, being the son of a not over-prosperous lawyer, who intended him for the priesthood. However, in Paris he became associated with Brisson and Haüy, the naturalists, and the outbreak of the Revolution further induced him to change his destination. Ultimately he entered the Museum of Natural History, where he allied himself with Cuvier, and both together helped to build up that famous zoological collection and to plan the Jardin des Plantes. He accompanied Napoleon to Egypt in 1798, and Junot to Portugal in 1808. In 1818 appeared the first part of his *Philosophie Anatomique*, in which he set forth his long-cherished views as to the unity of organic structure. When he went on to extend his theory to the invertebrate animals, Cuvier rose in arms, and a long warfare

ensued, ending, however, in peace and renewed friendship. Losing his sight in 1840, Geoffroy St. Hilaire died in 1844.

Geography, ASTRONOMICAL or MATHEMATICAL, is that department of the science which treats of the relations of the earth to the other heavenly bodies; of its form, size, and movements; of the mathematical divisions of its surface and the determination of the true position of places on that surface; and of the delineation of its surface on maps. Several of these topics have been already dealt with in the article EARTH (q.v.). The earth is the third, or possibly the fourth planet (q.v.) in order of distance from the sun, round which it travels in an elliptic orbit at a mean distance of 92,800,000 miles, accompanied by one satellite, the moon (q.v.). This movement round the sun is termed *revolution*; and the time occupied by the earth in performing it, a *year* (q.v.). The rate at which it moves, though averaging rather more than 65,000 miles an hour, varies with its distance from the sun, which occupies one focus of its orbit. In consequence of this revolution the sun appears to describe a circle in the heavens in the course of a year, moving constantly towards stars farther east, whilst the stars last seen near the point where it appears to rise, and those first seen near where it sets, differ at different seasons. The earth has also another movement, that of *rotation*, turning on its own axis, the line forming its shortest diameter, once in a *day* (q.v.) from west to east. This causes the apparent movement of the sun and other stars from east to west, and also the alternation of light and darkness, day and night, there being always half of the globe turned towards the sun and half away from it. Since an entire rotation takes twenty-four hours, the *circle of illumination*, or line of junction between the dark half and the illuminated half of the surface, traverses $\frac{1}{360}$ th of the circumference in four minutes, and this distance is termed a *degree of longitude* (q.v.). The line due north and south through any place—i.e. the line occupied by the circle of illumination at any one moment—is the *meridian* (q.v.) of that place, and the meridian that marks the advancing edge of the circle of illumination unites places having simultaneous sunrise, whilst that marking its retreating edge unites those experiencing sunset. There is no natural starting-point from which to measure longitude, no natural *standard meridian*: but that of Greenwich Observatory is now generally adopted as 0° , degrees being numbered east and west from it to that of 180° , the other half of the same great circle or circle which, like all meridians, by passing through the two poles divides the earth's surface into two equal hemispheres.

On the other hand, in the extremities of the axis, or *poles*, we have two naturally fixed points from which *latitude* (q.v.), or distance north and south, can be calculated, but we measure it from a circle midway between the poles known as the *equator*, which is reckoned as 0° , the poles being 90° N. and 90° S. lat. respectively, and 89 parallel small circles, or *parallels of latitude*, a degree apart and diminishing in diameter towards each pole, being described

between the equator and each pole. By reference to these two sets of lines the position of any spot on the earth's surface can be defined.

Degrees of longitude diminish from rather more than 69 miles at the equator to nothing at the poles, whilst a degree of latitude is everywhere about 69 miles, and would be of uniform value but for the flattening of the earth at the poles. That it is so flattened, or is an *oblate spheroid* (q.v.), and the amount of flattening, about $13\frac{1}{4}$ miles at each pole, is demonstrated by experiments on the increase of the attraction of gravity as we travel polewards, as indicated either by a spring-balance or by the increased number of oscillations of a standard pendulum (q.v.); and by the careful measurement of arcs of the meridian in various latitudes.

The fact that the earth's axis of rotation is not perpendicular to the plane of its orbit, or, as it is termed, the *ecliptic* (q.v.), but is inclined to it at an angle of $66^\circ 32'$, causes that inequality in the length of day and night and in the noon altitude of the sun that we know as the *seasons* (q.v.). Thus about March 22nd the sun appears vertical over the equator, and we have equal day and night of twelve hours each over the whole world (except at the poles), whence this season is called the *vernal* or *spring equinox*. After this the days exceed the nights in length in the northern hemisphere until about June 22nd, the sun constantly attaining a higher noon altitude and so appearing to travel northward until that date, when it appears vertical over all places $23\frac{1}{2}^\circ$ N. of the equator, whilst the north pole, and by that date all the area $23\frac{1}{2}^\circ$ S. of it, passes the whole twenty-four hours within the circle of illumination. The days in the northern hemisphere then shorten until September 22nd, the *autumnal equinox*, so that the sun appears to have reached by June a culminating point or turning-line, whence this June season is termed the *summer solstice*, and the line $23\frac{1}{2}^\circ$ N. of the equator a *tropic*. Similarly, on September 22nd, the sun is again vertical over the equator, and by December 22nd, the *winter solstice*, over the southern tropic. The variation in the length of the day, and in the directness or obliquity with which the sun's rays strike any part of our earth, thus produced, are two of the most important factors in climate, but are the same for all places on the same parallel of latitude. The greater length of the summer day as we approach the pole to some extent compensates for the low altitude of the sun, allowing corn, for instance, to be grown even within the Arctic Circle.

By means of the natural lines of the tropics and circles, $23\frac{1}{2}^\circ$ and $66\frac{1}{2}^\circ$ respectively from the equator, the earth's surface is divided into five zones of illumination—the torrid, two temperate (northern and southern), and two frigid zones; but the distribution of land and water and other minor causes prevent these being true zones of climate (q.v.).

One other relation of the earth to other heavenly bodies is of geographical importance—viz. the differential attraction of the moon, and to a low degree, owing to its enormously greater distance, of the sun, upon the land and the water of our globe, which produces the *tides* (q.v.).

The *projection* of the whole or a part of the

earth's curved surface on to a flat one, such as a sheet of paper, forms a *map* (q.v.), and the various modes in which the circles of latitude and longitude may be represented practically constitute the differences between the various methods of projection.

Geography, PHYSICAL, though sometimes taken as including those topics here alluded to as Astronomical or Mathematical Geography (q.v.), may be succinctly defined as that department of the general science of geography that deals with the scientific description and explanation of the present natural aspect of our earth and its inhabitants, and the changes that are now taking place on its surface. Since all the phenomena that we see around us to-day are but the results of countless series of changes that have been in progress during incalculable ages, physical geography is in some respects the last chapter of geology (q.v.); but, from the light which the investigation of causes now in operation throws upon the agencies at work in past times, its study forms practically a most important introduction to that of the dynamical department of geology. Physical Geography includes the study of the atmosphere (q.v.); its temperature, moisture, pressure, and consequent movements or winds (q.v.), most of which conditions make up that which we term climate and form the subject of the special science of meteorology (q.v.). It also deals with the inner, aqueous envelope, which covers about eleven-fifteenths of the surface of the globe, the ocean (q.v.) or *hydrosphere*, with its waves, tides (q.v.), and currents (q.v.). In relation to the solid earth, or *lithosphere*, the science deals with its distribution in continents and islands; its horizontal contours, or coast-lines, and its vertical contours, or relief, in plains, plateaux, hills, mountains, and valleys; the agencies that have effected this *earth-sculpture*, such as frost (q.v.), rain (q.v.), underground waters, rivers (q.v.), glaciers (q.v.), and ocean-waves, the *epigene* or surface agencies, as they are termed; and those more obscure, because *hypogene* or subterranean, agencies, including the earthquake (q.v.) and the volcano (q.v.) and also probably other less violent agents which result in the tilting, folding, and crumbling of originally horizontally stratified rocks in the processes of *mountain-building*. Finally, Physical Geography is concerned with *chorography* or the distribution (q.v.) of vegetables and animals as affected by such natural causes as soil, temperature, light, moisture, altitude, proximity to the sea, and climate generally, together with their involuntary or instinctive migrations. One of the most interesting generalisations in this department of the science is that the successive altitudinal zones of vegetation on a snow-clad mountain near the equator from the sea-level to its summit present much similarity to the latitudinal zones met with at or near sea-level in going from the equator to the poles. The distribution of the various races of man, the subject of *ethnography*, and the physical causes which limit the dispersal and affect the concentration of the human species under the operation of its own free-will, form the transition from Physical to Political Geography. Whilst the intense cold and long

winters of the north allow only of the scanty vegetation that furnishes pasture for the reindeer of a small nomadic population, the enervating heat of the luxuriant tropical regions proves equally fatal to human energy. The oldest civilisations of which we have any record arose in the warmer temperate zone, and were in some cases, as in those of Assyria, Babylon, and Egypt, promoted by the fertilising effects of periodical inundations of rivers, whose waters were available for irrigation. Later empires, such as much of that of Rome, Britain, Germany, and the United States, have originated in colder regions, where forests have had to be cleared and fens to be drained. Natural facilities, such as good harbourage, a tidal or other navigable river, the confluence of two rivers, the possibility of bridging a river, the convergence of mountain-passes, an oasis in a desert, a good supply of spring-water, or the proximity of mineral wealth, such as coal and iron, have determined originally the position of most large towns. Even their expansion in modern times may be similarly influenced, as in the cases of the suburban villages on the patches of water-bearing gravel round London, which are only now being connected by buildings over the intervening waterless clay districts, and of the often-flooded meadows of the Lea that so obstruct the spread of the metropolis eastward.

Geographical Distribution. [DISTRIBUTION.]

Geology may be defined as the science of the composition, structure, and physical history of the earth. The study of this comprehensive subject by scientific methods is of very recent date, belonging almost entirely to the present century; and, though an immense accumulation of facts and their logical inferences has already been collected, very much yet remains to be learnt. In former times many speculative guesses were made at the causes of some of the appearances presented by the rocks forming the earth's surface, the fossils they contain, the mountain-chains into which they are elevated, or the earthquakes and volcanoes by which they are disturbed. These guesses were, however, but little supported by any systematic appeal to facts, whilst modern geology is recognised as pre-eminently a science of observation, finding the chief explanation of the structure and history of the rocks in the facts of Physical Geography (q.v.), and holding it illogical to imagine unknown agencies to have operated in the past until we have exhausted the possibilities of those now in action. Subject to certain qualifications as to the very beginnings of its record, it has, therefore, for its chief principle that known, from its populariser, Sir Charles Lyell, as the Lyellian maxim, that the causes in operation in the past were the same in kind and even largely in degree as those now in action.

To aid him in his investigations the geologist borrows so largely from chemistry, mineralogy (q.v.), botany, zoology, physics, and even from mathematics and astronomy that the very existence of geology as an independent science has been denied. It would, however, be as reasonable to refuse the name of science to the study of history

because of its indebtedness to literature and other subjects. The methods of the geologist and the various branches of his inquiries have, indeed, often been compared to those of the historian deciphering the ill-kept and fragmentary chronicles of some forgotten races from records well-nigh obliterated and written in an unknown language. The crystal as it forms in the slowly-cooling glass of a volcanic lava, the rain-drop in the wet sand, the foot-print in the clay, or the fragment of shell or bone, will be the letters of the geologist's vast unknown alphabet. The chemist may form laboratory-compounds by processes similar to those by which natural minerals have originated, or the comparative anatomist may reconstruct fossil animals from a few bones or teeth, just as the linguist reconstructs a language from a few fragmentary inscriptions. As, however, history takes us back into a mythical or semi-mythical period without beginning, so the oldest rocks which the geologist can examine tell him little or nothing as to the origin of the earth, but point rather to the former existence of other still earlier rocks now destroyed. Their materials have been reassorted or used again, much as those palimpsest parchments on which some more modern writing hides an effaced original. The rocks that do remain never contained more than a partial representation of the life or other conditions of the period in which they were formed. The perishable algæ, fungi, and mosses of former periods, the birds of the air, and many of the plants and animals that perished on dry land, where no sediment was accumulating, have left but few traces of their existence. The rocks, which may contain many fossils still unknown, have as yet in many parts of the world not been searched; and wherever we do examine them we find abundant evidence of much destruction having taken place. The waves of the sea or the action of frost and rain have reduced many rocks and their contained fossils to powder; and solution by percolating water, or crystallisation set up by pressure or by the heat of molten lava may have obliterated the fossils in other cases. This is what is meant by the *imperfection of the geological record*.

Just as there are perhaps six chief points of view from which a student of architecture might examine some historic ruin or building, so there are six main divisions to geological science. As he might take a wide view of the general relations of the building to the surrounding landscape or perhaps of the action of a smoky atmosphere in corroding its stonework, so in what is known as *Cosmical Geology* the geologist considers the earth as a planet, and the influence upon it as a whole, of various agents external to itself, such as the attractive influences of the sun and moon, producing the variations of seasons and tides (q.v.). This subject is, of course, largely identical with that of Astronomical or Mathematical Geography (q.v.); but it also includes several other important but largely hypothetical topics, such as the causes of the Glacial Period (q.v.) and other climatic variations in past times, the Nebular Hypothesis (q.v.), tidal retardation, and the probable age of the earth. With regard to this last question it may be as well to mention here that,

though geologists are unable to say anything in the least definite as to a chronology measured by years, it is admitted on all hands that even since the appearance of life on the planet millions of years, at least, have elapsed; but here, as wherever the science ceases to be purely observational, it is imperatively necessary to test every hypothesis by its agreement with ascertained facts.

The architectural student again might examine the materials used in the construction of the building, tracing the quarries whence the stones, slates, or brick-earth was dug, or the forests where the timber was felled. In the department of *Petrography* similarly the geologist deals with the rocks (q.v.) or solid substances of which the earth is composed from the point of view of their mineral constitution. Mineralogy (q.v.) is practically only a subdivision of petrography; but of the thousands of known minerals the geologist is chiefly concerned with only a comparatively small number, such as the *essential* and more commonly occurring *accessory* rock-forming minerals, the metalliferous ores, and their associated veinstones. Rocks are petrographically examined partly by chemical analysis, but mainly by the study of transparent slices under the micro-polariscope. [Rock.] Many of the chief groups of rocks, such as clay, sand, limestone, granite, coal, etc., are dealt with separately.

Thirdly, as a building might be investigated from an engineering standpoint, as to how the stones, beams, or girders have been raised, and how they have withstood the ravages of time, so in *Dynamical Geology* the agencies which have formed rocks in the past are studied mainly in the light of those which are now modifying rocks or forming new ones. Most of these agencies form the subject of Physical Geography (q.v.), and are here treated separately, such as wind, frost, rain, rivers, lakes, glaciers, the sea, and living beings. This last agency is so important, or rather the evidence of fossils (q.v.) as to geological history is so valuable, that it is often treated as a main division of geology under the name of *Palæontology*, the "science of ancient living beings," with two subdivisions, *Palæobotany* and *Palæozoology*. Though these subjects are mainly but a part of Botany (q.v.) and Zoology (q.v.), the facts that many fossils belong to types now altogether extinct, and that their very partial preservation necessitates methods of study entirely distinct from those employed in studying living beings, justify their being considered as a distinct discipline.

Fourthly, the purely architectural point of view that studies "style," how the materials are massed, the bricks bonded, the arches described, and the mouldings grouped, gives a name, hardly as yet naturalised from the German, to the division *Geotectonic*, the architecture of the earth, or study of rock-masses. This department deals with the stratification of sedimentary rocks, their foldings, faults (q.v.), and other deformations, the intrusions or other modes of occurrence of igneous rocks, with joints (q.v.) and with the cleavage, foliation, and other massive structures of metamorphic rocks.

So again, as the old building may be seen to be the work of many ages, often partially destroyed

and rebuilt in differing styles and revealing much of the history, social habits, religion, and general life of the times in which it was erected, so the rocks built up, disintegrated, and redeposited, with the fossils enclosed in them, like ancient coins placed under some foundation-stone, give us a *Historical Geology*, which endeavours to reconstruct the physical history of the earth and its inhabitants. This is so largely based on the fossiliferous stratified rocks that it is often termed *Stratigraphical Geology*. Leaving speculations as to the origin of the world to *Cosmogony* (q.v.), it endeavours to trace the physical geography of each successive age in the past. Though it is now recognised that there have been few, if any, great breaks of a universal character in the gradual succession of rock-formation and of animal and vegetable life on the globe, it is still convenient to divide the earth's story into periods, just as we divide history into Ancient, Mediæval, and Modern, or the latter in England into the Tudor, Stuart, and Hanoverian periods. The main divisions, as adopted and separately explained here, are:—

Tertiary or Cainozoic	{	15. Pleistocene	{ Recent or Post-glacial. Glacial.
		14. Pliocene or Crag.	
		13. Miocene.	
		12. Oligocene.	
Secondary or Mesozoic	{	11. Eocene.	
		10. Cretaceous.	
		9. Jurassic.	
Palæozoic—	{	8. Triassic.	
		7. Permian.	
Upper	{	6. Carboniferous.	
		5. Devonian and Old Red Sandstone.	
		4. Silurian.	
Lower	{	3. Ordovician.	
		2. Cambrian.	
Azoic		1. Archæan.	

Lastly, as we may imagine our architect sketching a bit of the building here or there, which brings out some detail of style or construction, or another that has some historical association, so the department of *Physiographical Geology* deals with the application of the study of the rock-masses, of the agents that modify them, and even of the effects of their mineral composition and age, to the explanation of the present landscape-features of the surface, discussing why we have a plain there, why that mountain-range has so serrated an outline while these hills are rounded, why this coast is precipitous and that forms a shelving bay, why this river cuts a ravine and that one forms a delta.

Geomancy. [DIVINATION.]

Geometer Moths, or GEOMETRÆ, a sub-section of moths, characterised by the fact that the larvæ have only ten legs—viz. the six true legs and two pairs of prolegs. These correspond to the third and fourth pairs, as the first and second pairs of prolegs are undeveloped. The name is derived from the peculiar character of the gait; the prolegs are at the hinder end of the body, and the true legs are at the front, the caterpillar, therefore, attaches itself by its front legs, and then brings forward the prolegs, the body being bent up into a graceful arch; having secured hold with its prolegs, it then

loosens the hold of the legs, and straightens out the body.

Geometrical Mean of two numbers is a number, whose square is the product of the given numbers. It is thus obtained by multiplying the two given numbers together and taking the square root of the product. The geometrical mean of 4 and 49 is thus 14. In algebra the geometrical mean of two numbers a and b is \sqrt{ab} . In Pure Geometry the geometrical mean of two lines is a line the square on which is equal in area to the rectangle contained by the two given lines. Euclid gives a construction for obtaining this mean.

Geometrical Progression is a series of numbers, each one of which is obtained from the preceding by multiplying it by a constant quantity. Thus, if we settle 3 as the first term of the series and 4 as the constant ratio just mentioned, the series will be—

3, 12, 48, 192, 768,

each term of which is 4 times the preceding term. If the constant ratio is $\frac{1}{4}$ and the first term 48, the series becomes—

48, 12, 3, $\frac{3}{4}$, $\frac{3}{16}$, $\frac{3}{64}$,

each term being one-quarter of the preceding term. There are definite rules for the summation of any number of terms in such a series. If the constant ratio is less than 1, the sum of an infinite number of terms is finite, and approaches a definite limit; thus—

$1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + . . .$ to infinity

approaches indefinitely near to 2.

Geometry is the study of the properties of space. It is probable that geometry was first studied by the Egyptians, there being manuscript evidence dating from 1700 B.C. Pythagoras, living in the 6th century B.C., founded a school of geometers, who were well acquainted with the matter which later formed the substance of Euclid's first two books. The metrical connection between the three sides of a right-angled triangle is known as "Pythagoras' Theorem." Eudoxus was the originator of the theory of proportion. Menæchmus discussed the conic sections. The conchoid (q.v.) is due to Nicomedes. Euclid (q.v.), about 300 B.C., wrote his *Elements of Geometry*, which has been retained till the present day as an introduction to the study of geometry. Archimedes of Syracuse, living in the 3rd century B.C., studied metrical properties of the conic sections, conchoids, and of various polyhedrons. Apollonius wrote a treatise on the conic sections about 200 B.C., and Ptolemy was almost as famous a geometer as an astronomer. Very little was done during the first part of the Christian era, the introduction of modern geometry dating from the year 1600. Analytical Geometry was invented by Descartes in 1637. Newton's *Principia* is marvellous from the geometrical point of view, so much being done by aid only of those geometrical facts that were known to the ancients. The greatest geometers of modern times have been Monge, Möbius, Steiner, and Chasles.

There are four geometrical entities with which we believe ourselves acquainted—points, lines, areas, and volumes. Various geometers have given meanings to these four entities, but they are best defined by the dimensions that are necessary to express them. As Euclid says, “a point is that which hath no parts and which hath no magnitude;” it is of zero dimension. A line is determined by length only; it is of one dimension, and it may be regarded as being generated by a point moving from one extremity to the other. A point in thus moving occupies an infinite number of different positions, from which we see that the line may be regarded as being composed of an infinite number of points in series. An area has length and breadth; it has two dimensions; it may be generated by a moving line, and may similarly be regarded as being composed of an infinite number of lines in series. Finally a volume is determined by length, breadth, and thickness; it has three dimensions, and may be traced out by a moving plane. It may be here remarked that a geometrical entity of the fourth dimension might, from analogy, be expected to be bounded by volumes, and to be traced out by a moving volume.

Geometry is divided into various branches, depending upon special properties of these entities.

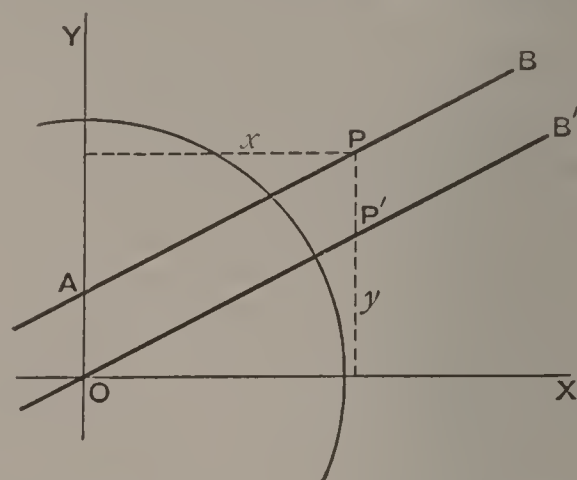
Plane Geometry treats of points, lines, and areas, which lie in a plane, which is a figure such that all the points in the line joining any two points in the plane, must lie wholly in the plane. Our notions of the meaning of a straight line are derived from experience, and it cannot be simply defined.

Solid Geometry treats of figures that are not contained by a plane; it does not only include the study of solids, but also of non-planar systems of points and areas. In Euclid's system Plane Geometry is discussed in his first six books; solid geometry in the eleventh and twelfth books.

Projective Geometry relates to figures obtained when a point is projected or thrown in a straight line from one position to another, the direction in which it is projected being determined by a point through which it is made to pass. A physical application of Projective Geometry is given in the theory of shadows, the edges of which will be seen to represent the position of projected rays of light. Projective Geometry is most studied in England as *Descriptive Geometry*, which aims at exact representation of plane aspects of solids. Thus, in engineering, a machine is drawn in elevation and plan, which are the views as seen from distant points vertically above it and in a horizontal plane. Near aspects of such solids will be in many respects different, and are studied in *Perspective*.

Analytical Geometry expresses the positions of points in various figures by their distances from given lines or given planes. Thus, the point P in the plane of this paper may have its position determined by its vertical distances from two given lines OX and OY. These distances are called co-ordinates of the point, the given lines being called the axes of the co-ordinates. Its distance from OY is generally called x , and from OX y . The x and y of every point in a given straight line follow a definite law; thus, if x is 2 inches, y has a fixed

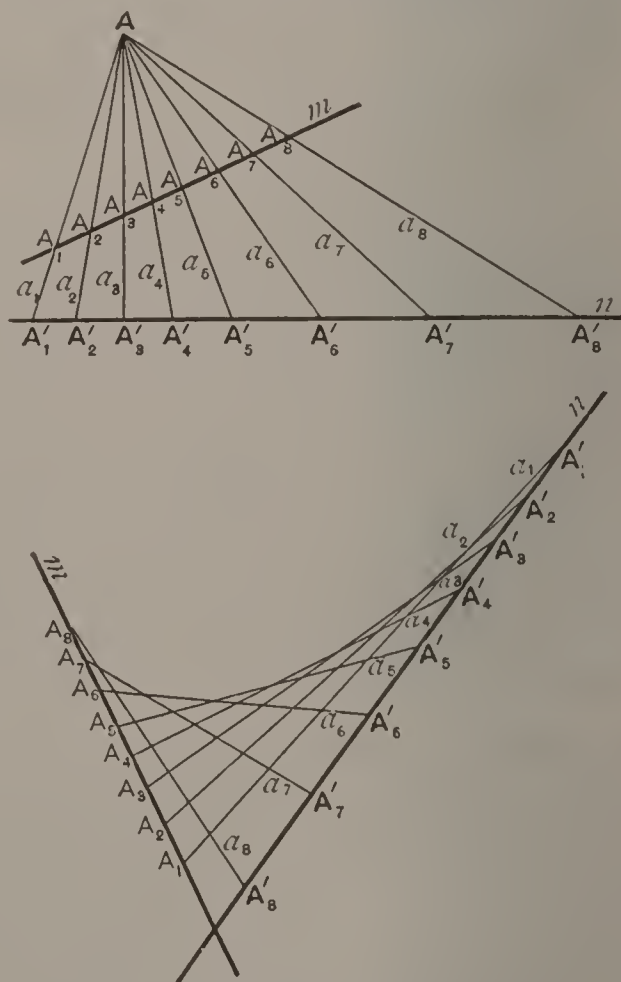
value. If the line passes through the point O, which is called the *origin*, the ratio $\frac{y}{x}$ for every point in the line will be always the same. The



CO-ORDINATE SYSTEM IN ANALYTICAL GEOMETRY.

expression of this fact algebraically gives what is called the *equation* to the straight line. It may be, for instance, $\frac{y}{x} = 2$, or $y = 2x$. Other lines in

the plane also have their equations, which become more complex when the line becomes more irregular. All the conic sections, including the circle, are expressed by equations of the second degree (q.v.) in x and y . This fundamental property is often taken as a convenient definition of a conic

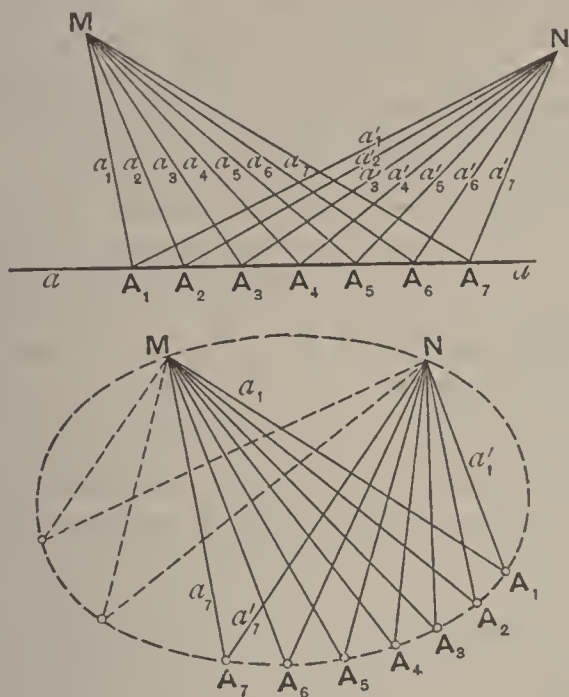


PROJECTIVE GEOMETRY, FIGS. 1 AND 2.

section, which, however, may be defined as the section of a cone (q.v.), or a projection of a circle from a point on to a plane.

But the best definition of a conic is given by a more elementary principle of projection. Let

$A_1, A_2, A_3 \dots A_8$ in Fig. 1 be a series of points in the line m , and let these be projected from a point A to the positions $A'_1, A'_2, A'_3 \dots A'_8$ in the line n . In the given positions the lines joining $A_1A'_1, A_2A'_2, \dots A_8A'_8$ all pass through the point A , and, therefore, may be said to determine it. But if m and n be placed in any other position in the plane such as that shown in the second figure, the lines $A_1A'_1$, etc., are seen to form the envelope (q.v.) of a curve. This curve is always a conic section, whatever be the position of the lines m and n ; and by the principle of duality (q.v.), which applies extensively in nonmetrical relations



PROJECTIVE GEOMETRY, FIGS. 3 AND 4.

in geometry, interchanging the words point and line in the above explanation, we derive the following method of getting a conic section:—Let $a_1a_2a_3 \dots$ in Fig. 3 be a series of lines through the point M . Let $a'_1a'_2a'_3 \dots$ be a series of lines through a point N , such that the points determined by (the intersection of) a_1 and a'_1 , of a_2 and a'_2 , a_3 and a'_3 , etc., lie in a line a . Next let the two sets of lines through M and N be displaced in any way in the plane, as shown in Fig. 4; then intersections of a_1 and a'_1 , of a_2 and a'_2 , etc., determine points on a conic. This method of studying conics is not so much known in England as it deserves, but is by far the most rational and comprehensive.

George, St., the patron saint of England, was a Roman military officer, born of a Christian family, who served with distinction under Diocletian. When the Emperor determined on the persecution of the Christians, George of Cappadocia remonstrated with him, and upon the failure of his remonstrance resigned his commission. He was arrested, and upon his refusal to renounce Christianity was put to death with torture in 303 A.D. He is honoured as a saint in the Roman Church, and is an especial favourite in Spain, and the Greek Church also has canonised him. His feast-day is the 23rd of April. Some confusion as to his life and deeds arose from the fact of his being confounded with a certain heretical archbishop of the same name. The Venerable Bede says he was

martyred under Dacian, King of Persia. The dragon with which he is generally connected came into the story later. St. George was a favourite saint of Richard Cœur de Lion, and the Council of Oxford in 1222 made his day a national festival, but it was Edward III. who made him the patron saint of England. The republics of Genoa and Venice were under the protection of St. George, and he is much revered by the Oriental churches.

George I., King of Great Britain, son of Ernest Augustus, Elector of Hanover, was born in 1660. In 1682 he married his cousin, the Princess Sophia Dorothea of Zell, but she was divorced in 1694, and during the rest of her life was confined in the castle of Ahlden. George became Elector of Hanover in 1698, and commanded the Imperial forces in the war with France. On the death of Queen Anne, in July, 1714, he was proclaimed King of Great Britain and Ireland, in accordance with the Act of Settlement. His arrival in England was followed by the formation of a Whig Ministry, and the Whigs remained in office throughout the reign. In 1715 the Jacobites made an abortive attempt at insurrection, which was suppressed by the defeat of the Earl of Mar at Sheriffmuir (November 13), and the surrender of Forster at Preston on the same day. This rebellion led to the passing of the Septennial Act in 1716. [ENGLAND.] In 1720 the South Sea Bubble (q.v.) involved thousands of families in ruin. George I. was a man of coarse tastes and immoral life. He could not speak English, and took little interest in English politics, leaving the conduct of affairs to Sir Robert Walpole (q.v.), who became Premier in 1721. Most of his time was spent in Hanover. He died at Osnabrück, whilst returning thence, on June 9, 1727.

George II. was born in Hanover in 1683, and succeeded his father in 1727. In 1705 he had married the Princess Caroline of Anspach. The Whig Administration of the preceding reign was continued. The period was one of political stagnation, but of great material prosperity, for Walpole took an enlightened interest in the progress of trade. His policy of peace and retrenchment was thwarted by a union of the discontented Whigs with the Tories, led by Bolingbroke, which was supported by Frederick, Prince of Wales, who had quarrelled with his father. Walpole was forced into a war with Spain in 1739, and finally driven from power in 1742. The struggle with Spain and France was continued during the Ministries of Lord Wilmington (1742-43) and Henry Pelham (1743-54), and was carried on with vigour during the Seven Years' War (1756-63) by William Pitt (q.v.), who was Secretary of State in the Ministry of the Duke of Newcastle. The victory over the French at Dettingen (1743) was the last battle in which an English sovereign was personally engaged. A Jacobite rising in 1745-46 ended in the defeat of the Young Pretender at Culloden. The coarseness and brutality which characterised the social life of the time were to some extent diminished through the religious and philanthropic efforts of John Wesley (q.v.) and his associates. Neither the material prosperity of the reign nor the military

lustre which the victories of Clive (q.v.) and Wolfe (q.v.) shed over its closing years can be in any way ascribed to the personal influence of the king. He died on October 25, 1760.

George III., the eldest son of Frederick, Prince of Wales, who died in 1751, was born in London on June 4, 1738. His health was always feeble, and as he grew up it became evident that he was weak in mind as well as in body. He was brought up by his mother, to whom he owed the notion of making his power absolute and using it for the welfare of his subjects. His political mentor was Bolingbroke (q.v.), the author of the *Patriot King*. On October 25, 1760, he succeeded his grandfather, George II. In the following year he espoused the Princess Charlotte of Mecklenburg-Strelitz. George at once exerted himself to end the war with France, and thus remove an obstacle which threatened the establishment of his supremacy. This policy was strongly opposed to the feeling of the country. The Peace of Paris was signed, but Lord Bute, a royal favourite, who had succeeded the Duke of Newcastle as Premier (1762), was driven from power by the popular clamour in 1763. Foiled in his first effort, the king attempted to realise his aim by making use of the mutual jealousies of the various Whig sections. Successive Whig Ministries were formed under George Grenville (1763-65), Lord Rockingham (1765-66), and the Duke of Grafton (1766-70). This period was marked by the successful assertion of important rights—the freedom of the Press, freedom of Parliamentary election, the publication of Parliamentary debates—through the agency of the popular champion, John Wilkes (q.v.). It was also during these years that a feeling of hostility was aroused in our American colonies by the imposition of unconstitutional taxes. In 1770 Grafton was succeeded by Lord North, but he was merely a tool in the hands of the king, who bribed members of Parliament to vote as he wished, and reserved preferment in Church and State, in the army and the law, for those whom he considered his “friends.” In spite of the remonstrances of Chatham, the resistance of the American colonists was regarded as rebellion, and a war broke out (1775) which ended in the discomfiture of the royal troops and the recognition of American independence (1782). While America was thus slipping from our grasp, the British power in India was being established under the able administration of Warren Hastings (q.v.) (1773-85). Meantime Lord North had been forced to resign, and, after a short-lived union of the Whigs under the Marquis of Rockingham (1782), Lord Shelburne, who represented the views of Chatham, became Premier, with the younger Pitt as Chancellor of the Exchequer. The Shelburne Ministry was overthrown by an unprincipled coalition of the Tories under North, with the disaffected Whigs who rallied round Fox, under the nominal leadership of the Duke of Portland. Fox was disliked by George III., who believed that he exercised a pernicious influence over the Prince of Wales, and, after his India Bill had been thrown out by the Lords, he and his colleagues were dismissed (1783).

Pitt then became Prime Minister. Throughout his long tenure of office he was a consistent Tory, and aimed at strengthening the power of the Crown, although the king was incapable of appreciating his far-reaching constitutional aims. In November, 1788, the king was stricken with madness, but he recovered in the following February. The universal joy expressed at the thanksgiving ceremony at St. Paul's showed that he had completely regained his lost popularity. Although strenuous in his efforts to maintain peace, Pitt was in 1793 forced into war by the aggressive attitude of the French revolutionary government. His policy was approved by the king, who sympathised with the misfortunes of the French monarch. George also regarded the Act of Union (1800) with much favour; but when Pitt attempted to follow up this measure by removing the political disabilities of the Irish Roman Catholics the king rejected the proposal on the ground that he “could not break his coronation oath,” and Pitt was forced to resign (1801). After a short administration under the incapable Addington, during which the Treaty of Amiens was concluded with the French Republic, Pitt returned to power in 1804 to carry on the war against Napoleon. On his death in 1806 the danger from France led to a temporary union of parties, but the “Ministry of All the Talents,” headed by Grenville and Fox, adopted a policy too Liberal for the king, and was dismissed in 1807. The Government again became Tory, and remained so for the rest of the reign, the Premiers being the Duke of Portland (1807-9), Perceval (1809-12), and Lord Liverpool (1812-27). In 1810, the king, overcome with grief at the death of his favourite daughter, the Princess Amelia, became hopelessly insane, and in 1811 was declared by Parliament incapable of ruling, the Prince of Wales assuming the royal functions as Prince Regent. The second war with France—in which the victories of Wellington were a source of as much glory to England as those of Nelson had been in the previous struggle—was brought to a close in 1815. The closing years of the reign were marked by a spirit of discontent among the labouring classes, which manifested itself in an agitation for the “radical reform” of the Constitution. The foolish violence with which all public expression of opinion was repressed by the Government led to fatal results in the Peterloo Massacre at Manchester (1819). George III. died on January 29, 1820. His private life was blameless. Unlike his predecessors of the same name, he was an Englishman in character and temperament as well as by birth and education. He was well-meaning, though narrow-minded and bigoted, and was greatly attached to his native country.

George IV., eldest son of George III., was born in London on August 12, 1762. Naturally prone to vice, he broke loose in his nineteenth year from the restraint in which he had hitherto been held, and entered on a career of reckless dissipation. At the same time, out of a spirit of opposition to his father, he began to associate on friendly terms with the Whig leaders, Fox and Sheridan. At the

age of 20 he secretly married Mrs. Fitzherbert, a Roman Catholic widow, thereby forfeiting his title to the throne, in accordance with the terms of the Royal Marriage Act of 1772. He disowned the marriage, however, and in 1795 was persuaded to marry the Princess Caroline (q.v.) of Brunswick, Parliament undertaking to pay his debts and increase his income. In 1811 Parliament declared his father incapable of governing, and a bill was passed constituting him Regent. In spite of his early leanings towards the Whigs, he continued the Tory Government of George III. (q.v.). The death of his only daughter, the Princess Charlotte (q.v.), in 1817 affected him to a degree which showed that he was not altogether devoid of natural feeling. He ascended the throne on the death of George III. on January 29, 1820. His first act as king was to create a public scandal by attempting to obtain a divorce from his wife, who was refused a share in his pompous coronation (July, 1821). She died in the following month. During the reign of George IV. the Government remained in the hands of the Tories. Lord Liverpool, who resigned in 1827, was succeeded by Canning (1827), Lord Goderich (1827-28), and the Duke of Wellington (1828-30). The king opposed the Catholic Relief Bill, but was finally induced to consent to it by the representations of the Duke of Wellington (1829). He died, worn out by his debaucheries, on June 26, 1830.

George, LAKE, also called Horicon, is in the E. of the state of New York, and forms the headwaters of Lake Champlain. There are hundreds of islands in it, and on the shores are some favourite summer resorts of the New Yorkers. The lake is 32 miles long, and near it was fought a famous battle in 1755 in which the French were beaten by the English, Indian allies taking part on both sides. Fenimore Cooper has utilised the lake for some of his most striking scenes.

Georgetown. 1. The port of entry for the district of Columbia, United States of America, is on the left bank of the Potomac, $2\frac{1}{2}$ miles N.W. of the capital, and now forming part of the city of Washington. There is an old-established Roman Catholic College here, and among the many industries the mills form a conspicuous feature. An aqueduct 1,446 feet long carries the Chesapeake and Ohio Canal over the river.

2. The capital of British Guiana—called under the Dutch *régime* Starbroek—is in the county of Demerara, on the Demerara river, 1 mile from the mouth. It is prettily situated, and has wide, straight streets, with canals in the centre, and the houses are for the most part surrounded by trees and built upon piles, and have open painted verandahs. By the river-side is a plain, unornamented street, which constitutes the business quarter. Among the public buildings is a large courthouse (built in 1834), cathedral, hospital, and barracks. The water is partly supplied by canals from a distance and partly by artesian wells. The harbour has a lighthouse.

Georgia, one of the 13 original states of North America, is on the Atlantic coast, having Tennessee

and North Carolina on the N., Florida on the S., South Carolina and the ocean on the E., and Alabama on the W. It is 320 miles long by 256 broad, and contains 58,000 square miles. On the coast are fertile islands separated from the shore by lagoons and sounds. To the low-lying coast succeeds a sandy plain sloping up to a hilly and mountainous district, which is fertile and healthy. Then comes a plateau of 60 or 70 miles broad, leading up to the Appalachian Chain, which passes through North Georgia. The Blue Ridge, as it is called in Georgia, contains the sources of the chief rivers, and is a gold-producing region. In the S.E. is a large swamp computed to be about 180 miles round. The chief rivers are the Savannah, Ogeechee, Altamaha, Santilla, and St. Mary, the Chattahoochee (forming part of the Alabama frontier), the Flint, and tributaries of the Suwanee. The mainland has 128 miles of coast, but there are few harbours except at the mouth of the rivers, the chief being St. Mary's, Brunswick, Dacien, and Savannah. The sea-island cotton was much noted formerly, but is now little cultivated, though the cotton grown on the mainland is still considerable in amount. The islands and the alluvial coast are favourable to the growth of rice, which is produced in large quantities; and what are called the pine barrens supply abundance of good timber. The soil of the middle regions is in a great measure worn out by over-cultivation, and now requires considerable treatment to enable it to produce cotton and tobacco. What is called the Cherokee country is very fertile, especially in fruits. The coast is subject to fever, and great heat prevails in the southern and central parts during summer, but the highlands are a famous health-resort. There are gold, copper, tin, silver, lead, and many varieties of precious stone. The state is divided into 136 counties, and among the towns Atlanta is the capital, and has large ironworks. Savannah is the chief port, and Augusta and Columbus are great manufacturing towns, being favourably situated both as to water-power and proximity of raw material for this purpose. There are 38 cotton factories, and 14 woollen factories, and countless grain and saw mills and other works. Much of the development of Georgia is recent, having followed upon the season of depression which succeeded the War of Secession, in which Georgia suffered much, especially in Sherman's great march. The railway system is being well developed. Until 1729 the district was occupied by the Cherokees in the N., and the Creeks in the S. In that year the land was surrendered by treaty, and in 1732 General Oglethorpe, with Government and public aid, founded a colony among the Indians. Georgia seems to have a great future before it.

Georgians, the principal branch of the South Caucasian group. [CAUCASIANS, III.] They are the Grusians of the Russians, both of these terms having reference to St. George, patron saint of the Georgian Christians. The native name is Karthveli, which occurs in the oldest chronicles under the form of Karthlosi—that is, descendants of Karthlos,

one of the legendary national patriarchs, founder of the Georgian nation. During the flourishing period of their history the Georgians occupied a vast domain along the southern slopes of the Caucasus; but they are at present mainly confined to the Russian government of Tiflis, which roughly corresponds to the old kingdoms of Karthalinia and Kakhetia. In 1892 the Georgian-speaking communities of this region numbered little over 310,000; the Mingrelians, Imeritians, Pshavs, Khevsurs, Lazes, and others of kindred speech, nearly 700,000; total South Caucasian family, about 1,000,000. The Kartli (Kartuli) or Georgian language is highly agglutinating and very harsh, with a surprising accumulation of consonants, as in *Mtkhet*, the name of the old capital of Karthalinia. It has long been cultivated, and is written in a peculiar character attributed to Mesrob, of which there are two varieties—*Khutzuri*, the Church alphabet, based on the old Armenian, and *Mkhedruli*, the current script in general use. Like Armenian, it runs from left to right. The Georgians rank physically amongst the finest races of the Caucasus, and they were taken by Blumenbach as the type of his Caucasian division of mankind. They are of tall stature, shapely figure, well-marked regular features, with black hair and eyes, large nose, often aquiline, giving them somewhat of a Jewish look. The grace and beauty of the Georgian women have long been proverbial, and for generations the harems of the Ottoman Sultan and pashas have been supplied from this source. Hence the modern Turks, especially the upper classes, have been almost completely assimilated in appearance to the general European (Caucasian) type. The Georgians were formerly subject chiefly to Persian influences, as shown by the national costume, which is still essentially Persian; but since the Russian conquest Persian have yielded to Slav influences, and during the present century European culture has made considerable progress amongst all classes of Georgian society. The national Church does not form a separate rite, like the Armenian, Coptic, Greek, and others; hence most of the Georgian Christians recognise the Armenian patriarch, while a few are "Uniates"—that is, united to Rome.

Geotropism, a term applied in vegetable physiology to the effect of gravitation (q.v.) upon the direction of growth. Growth towards the centre of gravity, which is characteristic of roots, is termed *positive*; that away from the centre of gravity, characteristic of stems, *negative* geotropism. Leaves (q.v.), especially those that are flattened and differ in the structure of their upper and under surfaces, are commonly *dorsiventral*, placing themselves, that is, at right-angles to the direction of gravity by what is termed *diageotropism*. To demonstrate that the force directing the growth of roots and stems is gravitation, and to measure the intensity of this tendency to *rectipetality*, or growth in a straight line, an apparatus known from its inventor, Thomas Andrew Knight, as *Knight's machine*, is employed. It consists of a wheel, which can be rotated in a horizontal or in a vertical plane, or with an alternating or rolling

motion, round the edge of which seedlings are planted, so that when it is rotated centrifugal force is substituted for gravity. On this machine, if moving vertically or horizontally, roots tend to grow outwards and stems inwards; but with the rolling or alternating movement they grow indiscriminately.

Gephyrea, a class of worms, of interest owing to the many theories that have been suggested as to their true affinities. They are cylindrical or almost so, and are not marked off into distinct rings or segments like the earth-worms, etc. The anterior part of the body is provided with tentacles, or is prolonged into an extensile proboscis (prostomium); in either case the whole front of the body may be withdrawn into the animal. There may be a pair of hair-like setæ at the anterior end of the body, and in some cases also one or two rings of setæ. The mouth is situated at the base of the proboscis, and the anus opens either at the extreme hinder end of the animal or on the dorsal aspect of the body near the anterior end. The nervous system consists of a band round the pharynx, from which a ventral cord runs backward through the body. There is a large body cavity (coelome), filled with a fluid containing many small corpuscles. Nephridia are present, and may serve as the generative ducts. The sexes are distinct. They are all marine. The class is divided into two groups—the *Gephyrea chætifera*, which have a pair of setæ and the mouth at the posterior end of the body, and the *G. achæta*, in which the mouth is at the extreme anterior end, and the adult has no setæ. The latter group is divided into two families—the *Sipunculidæ* and *Priapulidæ*; the former has a pair of nephridia, which serve as the genital ducts, while the anus opens on the dorsal side of the animal; in the latter the anus is nearly terminal. The affinities of the Gephyrea have been much discussed, and they have been classed with the Echinoderms through the resemblance of *Sipunculus* to the Holothurians (Sea-cucumbers) and the possession of a water vascular system. By another school they have been allied to the Bryozoa from the resemblance of some of the *G. achæta* to *Phoronis*. [BRYOZOA.] Later researches have, however, shown that the class must be regarded as a degenerate group of worms, in which the normal segmentation has been lost; this is shown by the traces of segmentation represented by the four anterior pairs and one posterior pair of nephridia in some of the *Chætifera* and the rudimentary setæ; but with which division of the worms they must be most closely associated is still doubtful. Thus the males of *Bonellia* are minute and much like mature Planarians, whereas the characters of *Echiurus* ally it to the Chætopods (q.v.); the family of the *Sternaspidae* may be placed either among the Chætopods or the Gephyrea. It is probable that several forms now included in this class must be separated from it, and the remainder may then be regarded as a group of degraded worms, allied most closely to the Chætopoda (q.v.).

Gepidæ, a Tentonic people, apparently closely akin to the Goths (q.v.). They are said to have

migrated from the mouth of the Vistula to the banks of the lower Danube. They subsequently fell under the dominion of the Huns (q.v.), and formed part of the vast host which followed Attila in his inroad into Western Europe. After the overthrow of the Huns, they established a powerful kingdom in Dacia, adjoining that of the Lombards (q.v.) in Pannonia. In 566 they were overthrown by the Lombards in conjunction with the Avars, and henceforward disappear from history.

Gera is the chief town of the principality of Reuss-Schleiz, and is situated in a valley of the White Elster, 35 miles S.W. of Leipzig. It was burnt in 1780, and the modern town is well built. Among the principal buildings are the churches of St. Salvator and Holy Trinity, town-hall, banks, central hall, and many schools. The castle of Osterstein—now rebuilt—dates from the 9th century. The chief industries are wool, cotton, silk, and tapestry manufactures, and artificial flower making.

Geranium, the genus giving its name to the order *Geraniaceæ* among dicotyledonous plants. It comprises upwards of 100 species, almost all herbaceous and natives of temperate regions, mainly in the Northern hemisphere, 12 being British. They derive both their scientific and their popular name, which is *Cranesbill*, from the long beak-like carpophore, to the sides of which the five styles adhere until the carpels are ripe. They have swollen stem-joints; stipulate and usually palmately dissected leaves; polysymmetric, pentamerous flowers, with ten stamens united at their bases and hypogynous. Most of the so-called Geraniums of our gardens belong truly to the genus *Pelargonium* (q.v.), are mostly natives of South Africa, and are distinguished by their monosymmetric flowers with an adherent spur to the calyx.

Geranomorphæ, in Professor Huxley's classification, a group of birds containing the Cranes and the genus *Thinocorus*.

Gérard, ÉTIENNE MAURICE, Marshal of France (1773–1852), was born in Lorraine. In 1791 he volunteered for military service, and fought under Bernadotte on the Rhine, in Italy, La Vendée, Spain, and Germany. For his services at Austerlitz he became general of brigade, and he took part in Jena, Erfurt, and Wagram. In 1812 he distinguished himself at Smolensk and the passage of the Beresina. After Napoleon's return from Elba he had a command, and was wounded at Wavre. He did not return to France till 1817. In 1831 he was at the head of an army sent to aid the Belgian Revolution, and in thirteen days drove the Dutch out of Belgium, and in 1832 he captured the citadel of Antwerp. He was War Minister in 1830, in which year he was made Marshal, and again in 1834. In 1835 he became Grand Chancellor of the Legion of Honour, and in 1852 senator.

Gérard, BARON FRANÇOIS PASCAL (1770–1837), was born in Rome, his father being attached to the French embassy there. At 12 years old he came to Paris, and entered the studio of the sculptor Pajou, leaving it afterwards for that of the painter,

Brenet, and then for that of David. He then was in Rome for a time, and then in Paris, where he aided David in his portrait-painting. In 1794 his *Tenth of August* won a prize. In 1795 appeared his *Belisarius*, followed by *Psyche et L'Amour* in 1797. He had now achieved fame, but prosperity did not suit him, and his work degenerated in quality. He painted many notable portraits.

Gerard, JOHN, herbalist and surgeon, was born in 1545. After travelling, possibly as a ship's surgeon, he settled in London, superintending Lord Burleigh's gardens in the Strand and at Theobalds, and afterwards practising as a barber-surgeon and having a garden of his own. In 1597 he published his *Herball, or general historie of Plants*, a translation of Dodoens' *Pemptades* (1583), which long remained a popular work, mainly owing to its revision in 1633 by Thomas Johnson. Gerard died in 1612.

Gerenuk (*Lithocranius walleri*), a gazelle (q.v.) from Somaliland. Mounted specimens in the Natural History Museum, South Kensington, show the giraffe-like neck of these animals.

Gerhardt, CHARLES FREDERIC (1816–1856), was born at Strasburg, and educated there and at Carlsruhe. He found great delight in chemistry, and, being disgusted with the commercial life to which he was condemned, enlisted in a cavalry regiment. This, too, did not suit him, and, having been bought out, he studied chemistry under Liebig at Giessen. In 1838 he went to Paris, and here a *Memoir on Essential Oils* attracted notice, and he was appointed Professor of Science at Montpellier. This post he retained till 1848, when he went to Paris till 1855, being afterwards appointed Professor at Strasburg. He could not teach, but was a deep thinker, and his writings have had great influence upon modern chemistry.

Gerizim, a high mountain of Samaria at the W. of a fertile plain, and forming with Mount Ebal the valley of Sichem. The W. side is bold and rugged, but there are many springs, and the other slopes are green and fertile. Upon a plateau is said to have been the Samaritan temple, and on the top are the remains of a fortress and a church. The two mountains are the supposed scenes of the blessings and curses spoken of in the Old Testament.

German Catholics, a religious body in Germany, which seceded from the Roman Catholic Church in 1844. The movement was due to a Silesian priest named Ronge, who wrote a letter to Bishop Arnoldi, protesting against the exhibition of the Holy Coat at Trèves. This letter excited so much sympathy both among Catholics and Protestants that Ronge was encouraged to make a bold attack on papal supremacy and ecclesiastical domination. He aimed at instituting a national church, and denounced auricular confession, the celibacy of priests, and all interference with the right of private judgment. The German Catholic Church was founded in January, 1845, when Ronge was chosen head pastor. Not long before, the "Christian Apostolic Catholic Church," which professed somewhat similar views, had been founded

by J. Czerski, a priest at Schneidemühl, in Posen. At Easter, 1845, a conference of both bodies was held, at which an agreement was come to on points of faith, and it was determined to form a joint organisation. The Bible and the Nicene Creed were alone recognised as standards of belief, and the doctrines of purgatory, transubstantiation, and the seven sacraments were rejected. The movement was at first so successful that it seemed possible it might lead to the re-establishment of a reformed national church in Germany; but its Rationalistic tendencies speedily aroused the suspicions of Protestants as well as the orthodox Catholics; and the Government, fearing it might prove a revolutionary force, took measures to suppress it. Members of the body were subjected to harassing restrictions in Saxony and Prussia, and were actually expelled from Baden and Austria. Its progress was also checked through internal dissensions. Religious fervour gave place to political enthusiasm, and many leaders of the party, including Ronge himself, took a prominent part in the revolutionary movement of 1848. The Conservative reaction which followed was fatal to the hopes of the German Catholics. Ronge was compelled in 1850 to withdraw to London, and did not return to Germany till 1861. By 1858 the congregations had been reduced to one-half their former number, and the movement may now be regarded as extinct, the surviving members having, for the most part, joined some avowedly Rationalistic sect. The Old Catholics (q.v.) are a somewhat similar body of distinct origin.

Germanic Races and Languages. [TEUTONIC.]

Germanicus, CÆSAR, a noted Roman general (B.C. 15–A.D. 19), took his cognomen from his father, Claudius Drusus, the step-son of Augustus. The closeness of the young prince to the throne roused the jealousy of Tiberius. Tacitus is the chief authority for the details of his life. He served under Tiberius, and crushed a revolt in Pannonia and Dalmatia. Augustus gave him the command of the eight legions of the Rhine, and at the emperor's death the mutinous soldiers would have proclaimed Germanicus his successor, but he refused to allow it. He next proceeded to avenge the defeat of Varus by Arminius, and in two campaigns he crushed the Germans. The jealousy of the new emperor caused his recall, but he was so greatly esteemed and honoured by the Roman people that Tiberius sent him to conduct the campaign against the Parthians, assigning him a subordinate, Cn. Piso, governor of Syria, whose duty was to spy upon him and thwart his measures. Germanicus, in his journey, aroused further the jealousy of Tiberius by making a visit to Egypt—a thing explicitly forbidden to Romans of high position by Augustus. He returned to Syria, and there died, as was alleged, by poison. It is only fair to add that Tacitus' impartiality on the matter has been much questioned.

Germanium (GE) a metallic element discovered by Winkler (1886), in a rare mineral called

argyrodite. It is a greyish-white, brittle metal of sp. gr. 5.47, and has the atomic weight 72.3. If heated in air it forms the oxide GeO_2 , and melts at 900°C . It is unacted upon by most acids. As yet it has not been completely investigated, but the properties mentioned are what had been predicted by Mendeleef (1871) as those of a then unknown metal, which he termed Eka Silicon, and whose existence he prophesied upon the grounds of the Periodic Law (q.v.), to which therefore the discovery of the metal added confirmation.

German Literature. The languages spoken by the numerous tribes inhabiting ancient Germany form an important branch of the Aryan or Indo-Germanic family. From about the commencement of the 7th century, at least, can be traced their division into two groups—Low German and High German, a division which has endured until our own day; for though literary German, the language of the educated classes, is a High German tongue, Low German (to which English and Dutch are closely akin) has retained strength and vitality, and even literary vigour, among the peasantry of North Germany. The existence of a form of speech akin to but differing from both Low and High German is proved by the Gothic translation of the Gospels made by Ulfilas, Bishop among the Goths in the 4th century, and the languages of Denmark, Iceland, and the Scandinavian peninsula form a fourth branch of the same Teutonic group.

Under Karl the Great, who is commonly called Charlemagne, the conversion to Christianity of all German peoples was practically complete (*circa* 800). The only remaining fragment of German literature previous to this period is the *Hildebrandslied*—a single remnant from the time when the heroic saga and the beast-epic (*Thierepos*) flourished in rich profusion, drawing their materials from the echoes of the Great Migrations or from even earlier traditions. This fragment was probably written down at the commencement of the 9th century, possibly under the direction of Charlemagne, who himself commenced a collection of older poems and the compilation of a German grammar. The victories of Charlemagne over the Low German Saxons prevented the definite separation into distinct peoples of the Low and High German tribes, and facilitated the acquisition of a common literature; and the superiority of High German as a literary language is perhaps due to the fact that the tongue spoken at his court was a High German dialect. In the 9th century the word *deutsch* comes into use to express the speech of the German people as distinct from Latin and Romance. The development of learning and culture in the monasteries and the influence of the Church, due largely to Charlemagne, led to the adoption for a time of Latin as the language of literature, and only fragments (such as *Muspulli* and the *Krist* of Otfried)—all of a religious character and probably written by monks—remain of the German productions of the period. One of these, the *Heliand* (*Healer* or *Saviour*) is in a Saxon and Low German dialect. Alliteration is still the characteristic of these writings, but in Latin religious

works the way was being prepared for the adoption of rhyme.

The era of the Hohenstaufen Emperors is marked by the first great golden age of German literature (*circa* 1200). With the Crusades came the development of religious enthusiasm, a widening of ideas, and greater intercourse between the peoples of the western world. Chivalry brought with it new literary materials in its views of religion, love, and war; while the outburst of poetical genius among the troubadours of Southern France exercised a strong influence upon Germany. Among the most remarkable characteristics of the period are the following. (1) The development of the epic in the shape of poetical romances by both popular and courtly singers. The legends of the siege of Troy and of Alexander, of the Arthurian chivalry, and of Roland and Charlemagne form the main materials of these poems, but Heinrich der Glîchezare revived the old beast-epic in *Reinhart Fuchs*. Among the most famous writers are Conrad (*Rolandslied*), Heinrich von Veldeck (*Æneide*), Hartmann von Aue (*Arme Heinrich*), Wolfram von Eschenbach (*Parzifal*), Gotfried von Strassburg (*Tristan und Isolt*). (2) The compilation of the *Nibelungenlied* and the *Gudrunlied*, the grandest memorials of the older German poetry, in which traditions of the remotest antiquity are combined with the sagas of the *Völkervanderung* into magnificent epics, an element drawn from Christian and even chivalrous ideas being also represented. In the *Ortnit*, and the poems on the legend of Hugdietrich and Woldietrich, the materials are drawn from the sagas of Lombardy. (3) The creation of German lyric poetry by the "Minnesänger," poets of knightly rank, wandering singers who took for their theme the chivalrous passion of love (Minne), and surrounded it with all the charms of a strong and vivid imagination expressed in a wonderful variety of new verse forms. Even the Emperor Henry VI. is named as a Minnesänger. Several of the poets named under (1) belong to this class, but the best known writer of the Minnegesang was the famous Walther von der Vogelweide. Several didactic poems belong to this period, among which is classed the *Sünkerkrieg auf der Wartburg*, including the verses said to have been sung at a tournament attended by the chief Minnesänger. The first impetus to prose writing was also given under the Hohenstaufens in the compilation of the *Sachsen-spiegel* and *Schwebenspiegel*, codes of local laws, and in the religious writings of Meister Eckhart.

The succeeding period was one of decay and of degeneracy among the higher classes. The national horizon was narrowed by the growth of anarchy and confusion; constant struggles for supremacy prevented the Emperors from encouraging literature; divisions in the Church led to the neglect of learning. But by the German people a new impetus was given to poetry. The towns formed the one stable and prosperous element of national life, and here a new class of poets arose. Honourably distinguished from the town-writers who made a trade of poetry, composing in honour of princes and for popular festivals, the "Meistersänger" or workmen-bards were the members of guilds of poetry formed

in imitation of the craft-gilds and governed as to methods of composition by strict codes of rules. The most famous representatives of the Meistergesang were Michel Beheim, Hans Rosenplüt, and later Hans Sachs, the shoemaker of Nürnberg. To this age, too, belong the earliest German dramatic compositions, commencing with representations of Scriptural subjects and developing into the numerous "mysteries" and "Shrove-Tuesday plays." The Limburg and other chronicles were written in prose; and the speculative movement, commenced by Eckhart, was carried further by Tauler and the Mystics. Another marked phenomenon was the outburst of popular poetry in ballads and *Volkslieder*, admirably reflecting the life and feelings of the poorer classes. The Revival of Learning was not without influence in Germany, and its effects were shown in popular satires against the Church, the aristocracy, and the many vices of the times, such as the *Ship of Fools* of Sebastian Brandt (1494), the sermons of Murner, and the didactic and narrative works of Fischart. Among these works must be mentioned the great Low German poem of *Reineke Vos* (1498), in which the old *Thierrepos* is used as a powerful instrument of satire. To the 15th and 16th centuries belong the most of the *Volksbücher*, collections of popular tales and legends, such as *Tyll Eulenspiegel*, *Dr. Faust*, and *Amadis of Gaul*.

The Reformation marks an important epoch in German literature, characterised by the fixing of the literary language by Luther (1483-1546). By the year 1600 the idiom chosen by him—that of the Imperial and Saxon chanceries—was established as the medium of literary intercourse throughout Germany. His example in using it for his translation of the Bible (1522-34) and many magnificent hymns (Luther may be regarded as the founder of the *Kirchenlied*) was followed by the historians, such as Sebastian Franck, by the many composers of hymns and religious lyrics, and the mass of religious writers, of whom the chief were Arndt and Böhme. The influences of the time were, on the whole, favourable to the development of the drama, which received a considerable impetus at the hands of Hans Sachs (1494-1576) the Meistersänger, a voluminous playwright, and through the tour of a troupe of so-called "English players," who brought to bear on Germany the powerful dramatic influence of England.

The period immediately previous to and during the Thirty Years' War (1618-48) was one of complete literary decay, broken at first only by the occasional appearance of religious lyrics. Later, a genuine attempt at revival took place in the foundation of societies for the cultivation of literature such as the "Fruitbearing Society" (1617). Of this the greatest ornament was Martin Opitz (1597-1639), who laid down rules for the writing of poetry in a correct but cold and soulless manner in his *German Poetry* (1624). Opitz, with his follower Fleming, a talented writer of lyrics, Gryphius and the epigrammatist Logan, formed the "First Silesian School." The lowest depths of foolishness and bombast were touched by the "Second Silesian School" of Hoffmannswaldau and Lohenstein. Vigorous prose

was, however, written by Grimmelshausen, whose *Simplexissimus* (1669) is a series of pictures from the Thirty Years' War, and the satirists Moscherosch, Schupp, and Abraham a Sancta Clara. The extravagance of the Second Silesian School brought about a reaction, expressed in the simple lyrical poems of Brockes, Günther, and Weise, and the satires and critical works of Canitz and Warnecke. It was generally felt that poetry must be founded on the study and imitation of nature; but one result of this feeling was an important literary quarrel between the so-called "Leipzig" and "Swiss" schools, influenced by France and England respectively. Gottsched (1700-1766), the leader of the former, exercised much influence upon literary taste and poetical form. In his *Attempt at a Critical Art of Poetry* (1730), and in his dramas, he looked to the great French writers as models. The immediate cause of the quarrel was his attack upon a translation of *Paradise Lost* by Bodmer (1698-1783), who, with Breitinger (1701-1776), laid stress upon the imaginative rather than upon the intellectual side of poetry. The revival of a simple and natural taste was also largely assisted by Haller and Hagedorn, both strongly influenced by England. Among the services of Gottsched must be reckoned the purification of the drama, which he rescued from a state of absolute degradation, looking for his models of excellence, however, exclusively to French examples. During this period German philosophy had made steady progress. The great philosopher Leibnitz had at the end of the 17th century written in Latin, but his theories had been explained and expanded in German by his disciple Wolff. Thomasius, his contemporary, is noteworthy as the first professor who lectured in German and as editor of the first German periodical.

A profound influence was exercised upon Germany by the magnificent achievements of Frederick the Great, and literature now commenced to take its place as an expression of national life and feeling. The literary taste of the king himself was entirely under French influence, and he remained untouched by the newer developments in Germany. His approbation was reserved for Gottsched and for Gellert, the leader of the "Saxon school," composed of a number of young writers who contributed to a literary and critical publication known as the *Bremer Beiträge* (*Bremen Contributions*—founded 1745). Gellert was declared by the king to be "the most reasonable of all German scholars." Gellert's fables, tales, and religious lyrics enjoyed great popularity; and among other members of the school, Rabener, Elias Schlegel, Weisse, and Kästner deserve mention as dramatists and satirists. Gleim, a didactic writer who composed during the Seven Years' War the stirring *Prussian War Songs of a Grenadier*, Uz and Götz, included in the "Halle school," attained some reputation as writers of anacreontic verses. The new patriotic impulse is strong in the writings of Rammler and of Ewald von Kleist. Lessing's early friend.

We have now arrived at the time when German literature was to shake itself free from the

shackles of narrowness and conventionality imposed upon it by a long period of preparation and imitation, and to exhibit in its second golden age a richness, strength, and variety unsurpassed in modern times. The extraordinary development which took place in the latter half of the 18th century is associated primarily with four great names—Klopstock, Wieland, Lessing, and Herder. By the two former invaluable services were rendered to German poetry in respect of the development of language and metrical form. Klopstock (1724-1803) in his great poem of the *Messiah* and his *Odes* at once reached a higher level by virtue of both subject and treatment, showing the influence of Milton and the great English writers, and obtained prompt response from the deepest feelings of the national religious life, in spite of the occasional unreality which spoilt the sublimity of his works. In strong contrast to him stands Wieland (1733-1813), whose appeals to sentiment and "*Schwärmerei*" were strongly influenced by French and Greek models. The work with which his memory is now chiefly associated is the *Oberon*, but his productiveness was extraordinary, and enabled him to confer a new flexibility upon both language and style in both prose and verse. In one way his influence was injurious, in so far as he introduced a strongly sensuous and epicurean element. Closely related to the works of Klopstock are the writings of Gessner, Lavater, and Jacobi, while Musäus and Heinse show the influence of Wieland. A small group of poets, known as the "Göttinger Hainbund" ("Göttingen Grove League"), stood in strong opposition to Wieland and acknowledged Klopstock as inspirer and master. Of these the chief were Voss (1751-1826), famous for his translations of Homer and for the idyllic poem of *Luise*, Bürger (1748-94), well known through the celebrated *Lenore*, and many vigorous lyrics and sonnets, Hölty, whose odes and lyrics deal with the charms of country life, Martin Miller, and the two Counts of Stolberg. Claudius also is usually associated with this school.

In the formation of the modern period of German literature, however, the influence of Lessing (1729-1781) is supreme. The founder of modern German criticism, he is also the creator of the modern German drama. His smaller poetical works belong mainly to the lighter anacreontic school, but in *Minna von Barnhelm* he gave vigorous expression to the new patriotic feelings, and by this and other plays, notably *Emilia Galotti*, he placed the drama upon a higher level than it had ever before attained in Germany. But it is upon his critical writings that the fame of Lessing chiefly rests, and through them he opened up a new world of thought—for art by the *Laokoon*, for dramatic criticism by the *Hamburgische Dramaturgie*, for religion by the *Wolfenbüttel Fragments* and the great dramatic poem of *Nathan the Wise*. Lessing's style was a model of clearness and power. Less original than Lessing and narrower in range is Herder (1744-1803), but he did much to awaken a sense for the poetry of nature and of popular life by his *Cid* and the collection of lyrics called *The*

Voices of the Peoples, and to influence the methods of historical inquiry and criticism by his *Ideas towards the Philosophy of the History of Humanity*. Among prose writers of the period were Winckelmann, whose *History of Ancient Art* (1764) inspired the *Laokoon*, the popular philosophers Mendelssohn and Engel, Zimmermann (*Observations on Solitude*), and Möser, the first of the great modern German historians.

The strongly critical views of Lessing found opposition among a band of young writers who looked to Herder as their inspirer, and who conferred upon the decade 1770–80 the name of the *Sturm- und Drang-period* ("Storm and Stress Period"). Lenz, Klinger, Müller, Schubart—would-be original geniuses, rebels against the acknowledged canons of poetry and religion—form the connecting-link between the great writers of the earlier period and Goethe and Schiller.

These two great poets in their earlier works gave the finest and the best expression to the period of "Storm and Stress" which was now passing away—Goethe in *Götz von Berlichingen* and the *Sorrows of Werther*, Schiller in the *Robbers* and *Fiesco*; but both soon acquired complete independence and gave full scope to their own creative genius. The influence exercised by them, both independently and in co-operation, was unexampled. Goethe (1749–1832) stands pre-eminent in modern literature, and his wonderful manysidedness and long life enabled him to enrich German literature with works of the first importance in very many branches of composition, dramatic, lyric, epic, critical, narrative, and scientific. Schiller (1759–1805), though inferior to Goethe in imagination and range of sympathy, is no unworthy rival of his fame, and to the period of his classical perfection belong many of the most famous productions of the German muse. The friendship and co-operation of Goethe and Schiller between 1794 and Schiller's death in 1805 strongly influenced the intellectual development of both poets, and form one of the most remarkable phenomena in the history of literature.

The age of Goethe and Schiller was strongly influenced by the philosophical writings of the great Kant, who brought to its highest fame the German school of thought. The later writings of Schiller show many traces of the influence of Kant's *Critique of Pure Reason* (1781), and he applied its principles to æsthetics. The intellectual movement commenced by Kant was worthily continued by Fichte, Schelling, and Hegel, and (in a very different direction from the last-named) by Schopenhauer and Von Hartmann. Among prose writers Lichtenberg, Hippel, the great humourist Jean Paul Richter (1763–1825), and the educational reformer Pestalozzi (*Leonard and Gertrude*—1781), must be mentioned. The stage was for many years to a large extent occupied by the dramas of Iffland and Kotzebue.

An important literary movement dates from the period of Goethe and Schiller's fame—the so-called "Romantic School" (at its height 1796–1800). At first under their influence, then exhibiting a strong reaction against classical form and feeling and a tendency to seek for inspiration in the Middle

Ages and the East, its leading representatives are Hardenberg (Novalis), A. W. von Schlegel, F. von Schlegel and Tieck, author of many tales, novels, and critical works. To the two last-named is due an admirable translation of Shakespeare. The tendencies of the Romantic school were continued by many other writers—by Brentano and Von Arnim, who collected the old German lyrics in *Des Knaben Wunderhorn* (*The Boys' Wonder-Horn*, 1806–8) by Hoffman, who dwelt upon the mysterious and darker side of nature, Fouqué, best remembered by his little masterpiece of *Undine* (1813), and Chamisso, the author of *Peter Schlemihl* (1814), and by the dramatists Heinrich von Kleist, Werner, the inventor of the "fate-tragedy," Müller, and Grillparzer.

The patriotic outburst of sentiment during the War of Liberation, which found its expression in prose in Fichte's *Addresses to the German Nation* (1808), was celebrated in splendid lyrics by Körner (1791–1813) and Arndt (1769–1860).

The productive activity of Goethe continued until the close of his life, and we may consider him as the connecting link between the older period and that which commenced with the end of the War of Liberation. As in part belonging to the period of transition may be reckoned also Uhland (1787–1862), one of the greatest modern lyrical and ballad writers, the centre of the "Swabian School" (including Kerner, Schwab and Mörike), and Rückert (1789–1866), distinguished for his translations and adaptations from Oriental languages. The subsequent period was one of repression and popular discontent. The wretched novels of Clauren were widely read until extinguished by the scathing satire of Hauff (*Lichtenstein*, 1826); and the leading dramatists were Raupach, Affenberg, and Immermann, the author of *Münchhausen*. A strong revival followed, in which the foremost place is taken by Heinrich Heine (1799–1856—*Book of the Songs*, 1827), who as a composer of lyrics stands second only to Goethe and Schiller, and who gave to German prose style new powers of expression. Count Platen takes a prominent place as a finished and talented writer of sonnets and odes; and a school known as "Young Germany," strongly influenced by Heine and of which the chief members were Gutzkow and Laube, attempted to awaken political and social life by their romances and plays.

Among later lyrical writers of note are the Austrian poets, Count von Auersperg ("Anastasius Grün") and Nicholas von Strehlenau ("Lenau"), Hoffman von Fallersleben, Emmanuel Geibel, Freiligrath, Hamerling, Jordan, Scheffel, and many others. As elsewhere there has been in Germany a great development of novel-writing, and among writers of fiction Freytag, Scheffel, Ebers, Hahn-Hahn, Lewald, Marlitt. Heyse, Hackländer, Auerbach, Spielhagen, and many others are well known and widely read. Low German has again produced works of real literary merit in the popular tales and poems of Fritz Reuter, one of the most genuine of German humourists. In dramatic literature the names of repute include Gutzkow, Laube, Grabbe, Hebbel, Halm (Münch Bellinghausen), Freytag, Lindau, Benedix, etc.

No sketch, however slight, of German literature would be complete without some mention of the immense services rendered by modern German scholars, theologians, travellers, philosophers, historians, and men of science. In travels Humboldt, Leipsius, Schlagintweit, Schweinfurth; in philosophy Überweg, Zeller, Fischer, Lange; in history, Niebuhr, Ranke, Mommsen, E. Curtius; in scholarship and philology, Grimm, Dindorf, Lachmann, G. Curtius, Schleicher, Bekker, Boeckh; in theology, Julius Müller, Olshausen, Neander, Baur, Wellhausen; in science Liebig, Helmholtz, Virchow—are but a few of the many illustrious names. Selection is, however, almost impossible, and space prevents anything approaching to a full catalogue from being here given.

It may be useful to remember that German literature exhibits two periods of exceptional richness and vigour—that of the Hohenstaufens (*circa* 1200), and that of Goethe and Schiller (*circa* 1800). Each of these is preceded by a period of poverty and decay, the one in the 10th, the other in the 16th century. It has been suggested that the year 600 may be taken as about the centre of another important period—that of the heroic sagas and popular epics—of which, however, only the one fragment of the *Hildebrandslied* has reached us.

German Silver, or NICKEL SILVER, is an alloy of nickel, copper, and zinc. The proportions in which these several constituents are present vary greatly with the mode of preparation and the use for which the alloy is required. For most purposes an alloy of about 5 to 6 parts copper, 2 to 2.5 parts nickel, and 2 parts zinc is employed. Owing to the very high melting points of the nickel and copper the preparation presents considerable difficulty, and is usually performed by melting the nickel and one-half the copper together, and then adding to the molten mass, under charcoal, an alloy of the zinc with the other half of the copper. When thus prepared it is of a greyish-white colour, is harder than silver, and capable of taking a high polish. It is, however, crystalline, and to get rid of this is heated, hammered, and rolled, after which it can be easily worked. Being much cheaper than silver and not tarnishing easily, it is very largely employed instead of this metal, but it has the disadvantage of being easily attacked by acids. It is also much used as a basis for electroplating, the layer of silver being usually deposited upon German-silver articles.

Germany is the central country of Northern Europe, and is situated between Russia on the east and France, Belgium, and Holland on the west. On the south it is bounded by Switzerland and Austria, and on the north it has towards Denmark a frontier of 53 miles, and a coast-line on the North Sea of 300 miles, and on the Baltic of 830 miles. The term "Germany" is now generally restricted to the German Empire as constituted in 1871, which stretches from long. $5^{\circ} 52'$ to $22^{\circ} 52'$ E., and from lat. $47^{\circ} 16'$ to $55^{\circ} 53'$ N. The *population* was in 1871, 41,058,792, in 1881, 45,234,061, and in 1891, 49,428,470; the

area is over 211,000 square miles, or about one-sixteenth of the entire area of Europe. Physically Germany is divided into two distinct portions:—(1) the great plain of North Germany, occupying about three-sevenths of the entire Empire, and covered with very recent deposits, with small areas of tertiary and secondary formations; (2) Central and Southern Germany, consisting largely of high tableland and mountain intersected by occasional plains, such as that watered by the Rhine.

The oldest *rocks* are the granites and schists of Bavaria and Bohemia. Triassic rocks occupy a vast area, and the Devonian system has a large extension. Igneous rocks are found in the Eiffel, Siebengebirge, and other mountain ranges. The greater part of Germany belongs to the basins of *rivers* which drain into the North Sea (Rhine, Weser, and Elbe) and the Baltic (Oder, Vistula, Memel, and Pregel), but the Danube flows through Germany for about one-fifth of its course, and drains the larger portion of Bavaria into the Black Sea. About one-half of the entire area consists of arable land, and there are also vast forests. The ordinary cereals are largely grown in the north; the vine and the tobacco and hop plants give rise to considerable industries in the south. Germany is rich in *minerals*, especially coal, iron, lead, copper, zinc, and the precious metals. The *manufacture* of cotton, linen, and woollen goods is largely carried on.

History. The first appearance of the Teutonic peoples upon the page of history is in the invasion of Roman Gaul by the Cimbri and Teutones. Half a century after their defeat by Marius, Julius Cæsar engaged in the conquest of Gaul, thoroughly subdued the German tribes settled to the west of the Rhine and temporarily united under Ariovistus. From this time the Germans were in close contact with the Roman Empire, and many of them served in the Roman army. But attempts to extend the reality of dominion over them were finally foiled by the annihilation of Varus and his legions by the great patriot Arminius, chieftain of the Cherusci, in A.D. 9, and the subsequent campaigns under Germanicus had little permanent result. Writing in A.D. 98, Tacitus has left us in his *Germania* a detailed account of the formidable nations inhabiting ancient Germany. Living in villages or single homesteads, they were united politically into hundreds and districts (*gauen*) under chiefs who were surrounded by a following of freemen bound to them by ties of personal affection and service. Society was organised into classes—nobles, freemen, *liti* (freemen, but without property in land or share in political life), and slaves. The family relation was of great importance, and the position of women one of much honour. The military force was composed of the entire body of armed freemen, and in peace government was carried on by meetings of all free members of the community.

In the second century the Roman frontier had to be defended against German aggression, and in the fourth century commenced that steady influx into Roman territory of the Teutonic races which was caused by the savage invasions and onslaughts of vast hordes of Huns from Asia. The Slavonic

peoples took part in the movement westwards—the Great Migration or *Völkerrwanderung*—and took possession of the German lands left vacant. Single tribes are now heard of no longer, but vast confederations of tribes press upon the Empire and form settlements and kingdoms—Alemanni, Bavarians, Franks, Frisians, Goths, Saxons, Thuringians. Of the monarchies which arose upon the ruins of the Roman Empire the most important was that of the Franks, divided into the Salian and the Ripuarian Franks, settled towards the

crushing defeat of the Saracens at Tours in 731. Besides saving the western world from Mohammedan conquest, he rendered powerful assistance to St. Boniface, the great English missionary, who effected during the eighth century the final conversion of the Germans to Christianity.

His grandson, Charles the Great, or Charlemagne, succeeded in 771 to undisputed authority over all Franks and, by conquest over the Lombards, Bavarians, and heathen Saxons, established one of the great empires of the world. His coronation as



MAP OF GERMANY.

mouth of the Rhine and on the middle Rhine respectively. Contact with the Empire and service in its armies had rendered them familiar with Roman ideas and the kingly power was greater among the Franks than with the other Germans. Under Chlodwig, who in 496 embraced the Christian faith and secured the support of the Church against his Aryan enemies, the whole of Gaul and much of Germany were united under Frankish rule. The old German popular assemblies had now fallen into disuse, and by grants of benefices and fiefs to powerful vassals the rulers had created a new aristocracy, which was especially powerful in the eastern division of the Frankish kingdom—Austrasia. The Merovingian successors of Chlodwig were an evil and feeble race, and under them the “Mayors of the Palace,” great officers of the Crown, rose to almost supreme authority among the West Franks. Two of these mayors, Pipin of Heristal and his son Charles, ruled the East Franks also as Dukes, and the latter earned the name of Martel (“the Hammer”) by his

Emperor by Pope Leo III. at Rome in 800 was the commencement of the Holy Roman Empire, which existed for ten centuries, and laid the foundation for many developments of later German history. To his encouragement of the Church is due much of the subsequent power of German ecclesiastical princes. He promoted good government by the strict enforcement of justice and by curbing the power of the great vassals. But only Charlemagne could rule his vast possessions. His successor, Louis the Pious, divided them among his four sons, and the result of the family struggles which followed was the separation of Germany from Gaul and of both from Burgundy and Italy at the Treaty of Verdun in 843. A separate kingdom of Germany was then formed under Louis “the German,” and although the dominions of Charlemagne were, with the exception of Burgundy, temporarily reunited under Charles the Fat in 884, his deposition in 887 was followed by the final separation of the East and West Frankish kingdoms. The incursions of the Norsemen were checked in 891 by Arnulf, but

they were followed by the savage attacks of the Hungarians during the reign of Louis the Child, with whom ended the race of Charlemagne in 911.

The royal power had now almost vanished, and the system of granting fiefs had resulted in the formation of a class of powerful local rulers—the Dukes of the great groups or confederations of tribes. The maintenance of central authority at all was probably due only to external danger from Slavs, Norsemen, and Magyars, and even this could not prevent constant warfare between the great feudal lords. Conrad of Franconia, elected by the leading nobles, was unable to enforce his authority, and was, at his own suggestion, succeeded by his great enemy, Henry, Duke of Saxony. A born leader of men, statesman and general, Henry I. (919–936) introduced a new civil and military organisation. He created the burgher class by the foundation of towns, compelling every tenth freeman to labour on their building, and these towns he made the centres for judicial administration, ceremonies and festivals, markets, and trade. He broke the power of the Magyars, subdued Danes and Slavs, and before his death private war had ceased. His son, Otto the Great (936–973), consolidated the royal power, and reduced the great Duchies to submission, keeping them in his own hands or in those of members of his family. In 951 he entered Italy to settle the affairs of the Lombard kingdom, but returned to cope with a revolt terminated only by the vital danger of an invasion by the Magyars, whose power was finally crushed in 955. Crowned Emperor by the Pope in 962, he set an example to subsequent German kings, who claimed the Imperial and Lombard crowns as of right; but the precedent led also to the continued absences of the German rulers in Italy and the severance of their interests from those of their own proper dominions. The sense of German nationality grew in his reign, yet this was accompanied by a weakening of central authority and the development of the power of the great vassals, dukes, and princes ecclesiastical and secular. After his death constant civil war increased their power until their growing independence was checked by Conrad II. (1024–1039), the first of the Franconian Emperors, who rendered the *mediate* nobles, vassals of the great lords, less dependent on their feudal superiors, and formed a close alliance with the towns. His son, Henry III. (1039–1056), further strengthened the royal power, put down private war, and in 1043 proclaimed a general peace. His attempted reformation of the Papacy and appointment of four German popes in succession commenced the long and fierce struggle between the Emperors and the Popes. During the minority of his son, Henry IV., the great nobles recovered much of their power. His opposition to the famous decree of Pope Gregory VII. in 1075 against the marriage of the clergy and their investiture by laymen was followed by his summons to Rome, his deposition of the Pope through a synod of German bishops, his excommunication and complete humiliation at Canossa in 1077. The dispute was only settled under his son, Henry V., by a compromise,

the “Concordat of Worms,” in 1122, but the power of the Papacy had been enormously strengthened. It had attempted to dispose of the Imperial Crown, and Innocent II. even claimed to have granted it to Lothar of Saxony (1125–1137) in 1133 as to a vassal.

With Conrad III. of Franconia (1137–1152) commences the line of the famous Hohenstaufen Emperors. The two great parties supporting the Pope and the Emperor now first became known as Guelfs and Ghibelines (Welfs and Waiblings). His successor, the great Frederick Barbarossa (1152–1190), was occupied in Italy during long years with the now permanent struggle against the Popes and the Italian cities supporting them. In Germany Teutonic power was extended over the Slavonic countries along the Baltic by Henry the Lion of Saxony and Albert the Bear, to whom was granted the Mark of Brandenburg. Under Frederick II. (1212–1250) the struggle with the Papacy was continued. Sentence of excommunication was launched against him, and a rival king was elected, and his continued absence in Italy led to the utmost anarchy in Germany. Meanwhile the conquest of the Slavonic lands now forming a great part of Prussia progressed steadily under the Knights of the Teutonic Order and of the Order of the Sword.

The period of the Hohenstaufens was one of great brilliancy. Chivalry was promoted in the Crusades, literature was in full bloom in the works of the Minnesänger, Gothic architecture received its finest developments, the towns increased in prosperity, many serfs were freed, and codes of local customs and usages were compiled, such as the *Sachsenspiegel* and the *Schwabenspiegel*. On the other hand, the greater vassals became practically independent, and the principle of inheritance was applied to their lands and offices. The privileges usurped by the ecclesiastical and secular princes were confirmed by Frederick II. in the “Pragmatic Sanctions” of 1220 and 1232, and the right of electing the Emperor was confined to the Seven Electors.

The period of anarchy culminating in the “Great Interregnum” (1250–73) is marked by the formation of the Rhenish Confederation of some seventy leading cities for mutual defence, and of the powerful Hanseatic League.

Rudolf of Habsburg, elected in 1273, revived the royal authority and strictly enforced justice, but his rule was unfavourable to the growing privileges of the towns. In this respect his policy was reversed by his successor, Adolf of Nassau (1291–1298), and by his son, Albert I. (1298–1308), who even befriended the serfs and the Jews. The long struggle between the Empire and the Papacy practically ended under Louis IV. (1314–1347), by the formal declaration of the Electors in 1338 that the Papal sanction was not needed to the election of the Emperor. Public peace was encouraged under Louis IV., and his friendship to the towns was constant. Industry and trade flourished more and more in the cities, and their government was now becoming more democratic through the victory of the craft-guilds over the old patrician families.

Charles IV. (1347-1378), the first Emperor who retained his hereditary lands on election, by the "Golden Bull" in 1356 regulated the method of election and confirmed the complete sovereignty of the Electors in their own territories. In 1396 the foundations of Swiss independence were laid in the victory of the "Eidgenossen" over Duke Leopold of Austria at Sempach. In the reign of Sigismund (1410-1437), who united the dignities of King of Hungary, King of Bohemia, and Margrave of Brandenburg, and who was the last Emperor crowned at Rome, the Hussite war, consequent on the burning of John Huss by the Council of Constance in 1415, foreshadowed the Reformation. The Mark of Brandenburg now passed to the Hohenzollerns, under whom it was to grow into the kingdom of Prussia.

The reigns of Frederick IV. (1440-1493), and Maximilian I. (1493-1519), the husband of Mary, the heiress of Charles the Bold, last Duke of Burgundy, bring the Middle Ages to a close. The age of chivalry was ended by the invention of gunpowder and the use of mercenary troops; the realities of feudalism had passed away, the Imperial authority had dwindled to nominal control, and princes and cities had attained independence. But the Imperial dignity was now permanently connected with the House of Habsburg and combined with great territorial possessions. The semblance and, to some extent, the reality of unity were established by the growing use of Roman law, by the constitution in 1495 of an Imperial Tribunal or Court of Appeal (the "Aulic Council"), and by the division of Germany in 1501 and 1512 into "Circles," each with its own "States" charged to carry out the decisions of the Imperial Chamber.

Luther's denunciation of indulgences was made in 1517, but the full storm of the Reformation burst after the accession of Charles V. (1519-1555), who united to the Empire the entire possessions of the kingdom of Spain. At the Diet of Worms in 1521 he took up the defence of the Church, and condemned Luther as a heretic. At the same Diet an Imperial Administrative Council was established, and a "Matricula" drawn up, settling the contingents of troops to be raised by the States, both of which existed until the fall of the Empire. The Reformation now made irresistible progress; a common name, "Protestants," was acquired by the Reformers at the Diet of Speyer in 1529, and a common statement of doctrines, the "Augsburg Confession," was drawn up in 1530. The new and the old religions were put upon an equality by the Religious Peace of Augsburg in 1555, in which, however, the Calvinistic or Reformed Faith was not included. In the fearful struggle which followed the Reformation the Imperial authority was completely ruined. The reaction against the new doctrines, due mainly to the zeal of the Jesuits, gave fresh strength to the Catholic party, the Reformation was stamped out in Bohemia, and complete toleration was not acquired by Protestants (including both Lutherans and Calvinists) until the Peace of Westphalia in 1648.

This was at the close of the disastrous and

merciless struggle known as the 'Thirty Years' War. The result of the confused period commencing with the abdication of Charles V. in 1555 must be briefly summed up. The Empire in Germany was practically ended and was now attached to the hereditary dominions of the House of Habsburg in Austria. The population of Germany was reduced by more than one-half; industry and trade had almost ceased to exist; enormous territorial losses had been suffered, and France and Sweden had made great acquisitions. Switzerland and the United Provinces were severed from the Empire, and had acquired complete independence. Germany emerged from the war a mere lax confederation of states, whose rulers—a race of absolute and, in most cases, coarse and selfish despots—were recognised by the Peace of Westphalia as independent. Even in the cities government had passed into the hands of local oligarchies. The only bond of union was the nominal authority remaining to the Emperor, and now transferred to the Diet, of passing laws, concluding treaties, and making war and peace. One completely good result of the war was that amid the prevailing anarchy were laid, by Grotius, the foundations of a system of International Law.

The Thirty Years' War was followed by the rise of Prussia. Brandenburg had in 1611 become united to the Duchy of Prussia, part of the possessions of the Teutonic Order, which was in 1657 declared independent of Poland of which it had been a fief, and received further accessions under the Great Elector, Frederick William. It grew steadily in power during the long struggle against the unscrupulous aggressions of Louis XIV., and in 1701 the son of the Great Elector, Frederick I., obtained from the Emperor the recognition of the Prussian Duchy as a kingdom. In 1713 a "Pragmatic Sanction" was drawn up by the Emperor Charles VI. (1711-40), providing for the inheritance of the Austrian dominions by his daughter, Maria Theresa, and this was ultimately guaranteed by the leading Powers. But his death in 1740 was the opportunity of Prussia, where Frederick II., better known as Frederick the Great, had just ascended the throne. He immediately occupied Silesia. Maria Theresa met with enthusiastic support in Hungary, and in 1745 her husband was elected Emperor as Francis I. (1745-65). An interval of peace was followed by the Seven Years' War, at the conclusion of which, in 1763, Prussia was confirmed in the possession of Silesia, took rank as a great Power, and became definitely the rival of Austria in German politics. The partition of Poland in 1772 gave her further territories. Frederick the Great, who died in 1786, though an absolute ruler, exercised his power with a complete absence of selfishness and for the good of his people, and left Prussia a compact, well-ordered, and flourishing kingdom. In 1785 he had formed against Austria a league for the preservation of the Imperial Constitution, the first serious attempt by Prussia in the contest for German supremacy. The French Revolution, with its quarter of a century of constant change and warfare, brought ruin and disaster to the older German states, which fell in succession

before the arms of France and the genius of Napoleon. By the second and third partitions in 1793 and 1795 Poland ceased to exist, and both Prussia and Austria were increased; but in 1801 the French frontier was extended to the Rhine, in 1803 Napoleon seized Hanover, in 1806 the Confederation of the Rhine was formed, consisting of the leading Central and South German states, but entirely under the control of Napoleon, and a few weeks later Francis II. formally resigned the Imperial Crown, and the Holy Roman Empire came to an end. The same year saw the defeat at Jena of Prussia, which had hitherto stood aloof from the struggle. The supremacy of France was marked by the annexation of all North-western Germany and the creation of the kingdom of Westphalia at the expense of Prussia. But the spirit of German freedom was not dead. A wonderful outburst of national feeling accompanied the reorganisation of Prussia under Stein, and all Germany joined in the colossal struggle which ended with Waterloo and the banishment of Napoleon to St. Helena.

In 1815 the Congress of Vienna made considerable restitutions and redistributions of territory, and a confederation was formed consisting of 39 German states, including four free towns, each independent in internal affairs but sending representatives to a permanent Diet in Frankfort under the presidency of Austria and regulating questions between the states. To satisfy the general and passionate desire for freedom it was provided that constitutional government should be set up in each state. The provision was shamelessly evaded; even in Prussia nothing was done beyond the establishment of provincial diets, and the reality of despotism was hardly tempered by constitutional forms. But the desire for German unity and German freedom grew ever more intense. A practical bond of union was constituted in the Customs Union (*Zollverein*) between Prussia, Bavaria, Württemberg, and other states. Revolutions in France produced reforms in the smaller states in 1830, and in 1848 a popular rising in Berlin resulted in the granting of constitutional government, while Liberal ministers were appointed in Bavaria and elsewhere. A "Provisional Parliament" of delegates from German states met in Frankfort, and was recognised by the Confederate Diet, which shortly afterwards ceased to exist, handing over its authority to the National Assembly, which appointed Archduke John of Austria as the head of a new central government. The great difficulty (apart from complications with Denmark as to Schleswig-Holstein) was the position of Austria, which had meanwhile had to grapple with a national revolt in Hungary. The refusal of the King of Prussia in 1849 to accept the title of "Emperor of the Germans" led to the dispersal of the Assembly. A period of confused intrigue followed. Prussia formed the "German Union" to the exclusion of Austria. Austria, rendered supreme over Hungary by Russian aid, summoned to Frankfort representatives to reconstitute the confederation. This assembly was finally recognised as a Diet by Prussia and the states which had joined her in the German Union. The revolution of 1848 was followed by increased despotism in

Austria and the smaller states, and it was only in 1857 that a Liberal policy prevailed in the Prussian government and Chamber. The accession to the Prussian throne of William I. in 1861, and the appointment as Prime Minister of Count Bismarck, threw foreign and domestic policy into the hands of one of the greatest diplomatists and statesmen of history. War with Denmark in 1864 was followed by disputes between Prussia and Austria, nominally as to the settlement of Schleswig-Holstein, really as to German supremacy, and in 1866 Austria was completely defeated and finally excluded from Germany. Even Bavaria and the states which had sided with Austria concluded alliances with Prussia, giving her supreme command in future wars, and a Confederation of German states north of the Main was formed under Prussian leadership. A Customs Treaty with the southern states led to the meeting at Berlin in 1868 of a Customs Parliament elected by the whole of Germany. In the great struggle with France the North German Confederation was supported by the southern states, and on January 18, 1871, the King of Prussia was solemnly proclaimed German Emperor at Versailles.

The *German Empire* was then constituted as a federation of 25 sovereign states, to which at the conclusion of the war was added Alsace-Lorraine as a common Imperial province administered by the central authority. Of these states Prussia, with over 28,000,000 of inhabitants, is by far the largest, and the Imperial dignity is hereditary in the Prussian royal family. The *representative bodies* of the Empire are:—(1) the Bundesrath, or Federal Council, of fifty-eight members, apportioned among the states roughly according to size, and annually appointed by the separate governments; (2) the Reichstag, or Diet, of 397 members, elected by universal suffrage and ballot for five years; executive power is vested in the Emperor, legislative in the Emperor, the Bundesrath, and the Reichstag. The Bundesrath, presided over by the Imperial Chancellor, acts under his direction as a supreme administrative and consultative board, with twelve standing committees, each including representatives from four states. Its consent is necessary for the declaration of offensive war. The Empire has supreme control over the army and navy, Imperial finance and commerce, posts and telegraphs (save in Bavaria and Württemberg), and railways as affecting national defence; and Imperial legislation takes precedence of that of single states in so far as concerned with civil and criminal law of general application, the general rights of German subjects, patents and copyrights, control of the press, and several other matters. With the exception of Alsace-Lorraine, and the Grand Duchies of Mecklenburg-Schwerin and Mecklenburg-Strelitz, all German states are constitutional—the six larger states possessing two chambers, the smaller states one chamber of representatives, and the free cities legislative assemblies.

The establishment of the Empire in 1871 has brought about a real union of the German states, which have been drawn ever closer together since the war. Peace has been observed, but a peace

purchased at the cost of the maintenance of an enormous standing army, which it is even now the object of the Government to increase. The German *army*, in which great improvements have been made since 1870, is probably the most effective military force which the world has seen, and is the standing symbol and constant instrument of German unity. *Education* is universal and compulsory, and has been brought to extraordinary perfection. There are twenty-two universities, and large numbers of technical colleges and excellent secondary schools of all sorts. The Empire has been largely organised under the vigorous administration of Prince Bismarck. The main result of his foreign policy has been a cordial alliance with Austro-Hungary. In 1872 an alliance was concluded between the three Emperors of Germany, Austria, and Russia, which was subsequently joined by Italy, and although of late years Russia seems to have, to some extent, withdrawn and to have favoured a French alliance, yet the Triple Alliance has been a constant factor in European politics. In domestic affairs many difficulties have been encountered. With the birth of the new Empire commenced the long struggle of Prince Bismarck with the Papacy. The Jesuits were expelled in 1872, and in 1873 the famous "Falk Laws" imposed secular restrictions on all ecclesiastical appointments. The strict enforcement of these laws led to intense discontent and ill-feeling among Catholics. The contest ended with the grant of many concessions and the confession by Prince Bismarck in 1887 that his policy was practically changed. A strong popular movement against the Jews—the "Judenhetze"—reached a head in 1881, and seems now to be gaining fresh strength. The democratic movement known as Socialism, aiming at the regulation and organisation by the State of labour and production has grown rapidly in strength and importance. The number of voters supporting Socialist candidates for the Reichstag has largely increased, and in 1890 thirty-five Socialist members were returned. The attempts on the Emperor's life in 1878 were attributed to this movement, and a series of repressive measures were passed giving the Government extreme police powers. On the other hand, Prince Bismarck recognised the need of dealing with the causes of discontent, and inaugurated an era of "labour policy" by legislation compelling employers to institute a system of insurance in favour of their work-people, since followed by the adoption of an important state-aided scheme of insurance against death and old age. In 1888 the Emperor William I. died, and the premature death, after a reign of three months, of the beloved Crown Prince, who succeeded him as Frederick III., disappointed the hopes of those who had anticipated a Liberal policy on the part of the Crown. His son and successor, William II., is a sovereign who takes a strong view of his functions as emperor and king. His reign has been characterised by the further development of the labour policy inaugurated by Prince Bismarck. The Emperor has not, however, been generally in accord with the views of the great Chancellor, whose resignation was accepted in 1891.

Of late years the desire of founding a colonial empire has been strongly expressed, and considerable acquisitions have been made in Africa. In 1890 a much coveted addition was made to the German Empire by the cession of the British possession of Heligoland.

Germinal Cells. [SPONGE.]

Germination, the sprouting of a seed or other plant-germ. Thus the term is applied to the first starting in growth, after a period of rest, of the spores (q.v.) of fungi, or even of the grains of pollen (q.v.), the male germ of flowering plants. The requisite conditions for germination are moisture, a certain degree of warmth, and, in most cases, a supply of air or oxygen. In many spores and pollen-grains germination consists in the imbibition of water (or of a dilute solution of sugar) followed by the rupture of an outer spore-coat, or *exospore*, and the protrusion of the inner coat or *endospore* in finger-like or thread-like processes (*hyphæ* or *pollen-tubes*). In the more complex seed (q.v.), among flowering plants, the process begins similarly by the imbibition of water, the testa or outer seed-coat softening, and the whole seed swelling. The primary root (*radicle*) (or, in the case of most monocotyledons, the adventitious rootlets) then protrudes through the micropyle (a minute hole in the testa). This may be followed, especially in small exalbuminous seeds, by the withdrawal of the cotyledons or seed-leaves which then rise above ground, become green, and at once commence assimilation, the testa being often carried up by them as a mere husk; or, in the case of more fleshy or of albuminous seeds, the cotyledons may remain within the seed, or only their petiolar portion be withdrawn, the first leaves to rise above ground belonging to the plumule or primitive bud of the stem. The cotyledons in albuminous seeds feed in a quasi-parasitical manner upon the albumen, serving merely as channels to transfer its nutriment to the young root and shoot. The first-mentioned method of germination is termed *epigeal*—i.e. above ground; the other, *hypogeal* or under ground.

Germ Theory of Disease. Ever since the end of the 17th century the notion that putrefaction and some forms of disease were associated with the development (in the decomposing substance or within the living body) of certain low forms of life, has been entertained. The researches conducted by Leeuwenhoek into the minute forms of life, which he discovered and studied in water, the tartar of teeth, saliva, etc., undoubtedly played an important part in directing attention to this subject; and, although Leeuwenhoek himself did not formulate any theory of a *contagium vivum* (that is, that contagions which produce disease are living parasites), his observations directed attention to a new field of inquiry, and were quickly taken up by the theorists of succeeding generations. The microscope employed by Leeuwenhoek, though a great improvement on anything that existed before his time, was necessarily very imperfect; and, as improved instruments came into use, more and more exact knowledge was obtainable with respect to

the extremely minute forms of life. In 1836 the discovery of an organism in fermenting yeast was first announced, and the theory was broached that the fermentative process was brought about by the growth and development within the fermenting fluids of this microscopic yeast plant. Evidence quickly accumulated in corroboration of this theory; and Pasteur, by a wonderful series of researches, established on a firm basis the notion that fermentation was a vital process. He studied what are now known as the *lactic*, *acetic*, and *butyric* fermentations, and showed that in each instance special characteristic germs were at work. What had now been shown to hold with respect to fermentation was quickly extended to diseased processes, and Pasteur was able to demonstrate that the disease of silkworms known as *pebrine* was due to a microscopic fungus. In 1849 Pollender observed that the juice expressed from the enlarged spleens of animals dead of splenic fever or anthrax contained multitudes of small rodlets, which were, he maintained, vegetable organisms allied to what were then known as *vibrio bacilli*; and he suggested that these rodlets were the cause of the disease. Davaine developed this discovery, and proved a cause and effect relationship between the bacilli and the disease. Meantime the study of the group of microscopic fungi, called by Naegeli *schizomycetes* or fission fungi, was being earnestly prosecuted, and the relationship between certain diseases and this group of minute organisms became more and more apparent. The notion that the development of germs upon wounded surfaces led to suppuration and the breaking down of tissue, suggested to Lister the advisability of employing germicidal substances in surgical dressings, and the great revolution of treatment which is implied in the term "antiseptic surgery" became established. Pyæmia and septicæmia were thus shown to be associated with bacterial growth; and, the germ theory being now well established, it became the fashion to discover a bacillus or micrococcus in every disease, and many hasty generalisations were made. More definite knowledge is now being gradually obtained, and the discovery in 1882 of the tubercle bacillus by Koch showed that one of the most common and destructive of morbid processes was caused by a germ; and not only this, the methods of study which Koch introduced gave promise of further achievements in this branch of research in the future. Koch further formulated four important requirements, which he maintained must be fulfilled before it could be considered that a cause and effect relationship between a given organism and a particular disease was demonstrated. (1) The germ must be shown to be present in the blood or tissues of the diseased animal; (2) this germ must be isolated from such blood or tissues, and obtained in "pure cultivation;" (3) this same pure cultivation, when inoculated into a healthy animal, must be capable of producing the disease in question; (4) the same germs must be again obtained from the blood or tissues of the diseased animal. It has not hitherto been found possible to fulfil all Koch's requirements in the case of many of the suspected disease-producing organisms, but in the case of

leprosy, relapsing fever, typhoid fever, malaria, diphtheria, erysipelas, and actinomycosis, the evidence is nearly as conclusive as in the completely established instances of anthrax and tubercle; while there is very good ground for supposing that it will be possible in the near future to make out a clear case in several other diseases. It may be remarked, in conclusion, that there is much reason for suspecting that certain low forms of animal life, quite distinct from the vegetable bacteria, are to be regarded equally with the fission fungi as disease-producing agents.

Gérôme, LÉON, a French painter, was born in 1824 at Vesoul. In 1841 he entered the studio of Paul Delaroche, in 1847 he exhibited, and soon after travelled for a time in the East. In 1861 he became Professor of Painting at the École des Beaux-Arts. His first notable work was *Age of Augustus and Birth of Christ*, and other well-known pictures of his are a *Roman Gladiator in the Amphitheatre*, *Phryne before her Judges*, and *Socrates Looking for Alcibiades at Aspasia's House*.

Gerona, the chief town of the Spanish province of the same name, is at the junction of the Ter and Oña, 54 miles N.E. of Barcelona. The old town has crumbling walls and ruined fortifications, and there is a fine Gothic cathedral with a remarkable nave, 73 feet wide, and a terraced façade, approached by a flight of 86 steps and topped with a rose-window. The town was besieged in 1809, and held out for six months.

Gerry, ELBRIDGE (1744-1814), an American politician, chiefly noted as having given rise to the term "gerrymandering" by rearranging the boundaries of electoral districts in the interests of his own party. It is said that an opponent remarked that one of the new districts was shaped like a salamander. "I call it a gerrymander," said another. Gerry was born in Massachusetts, and graduated at Harvard. In 1773 he was returned to the Massachusetts Assembly, and in 1789 to the first National Congress. In 1797 he was sent to France to negotiate a treaty, and in 1810 became governor of Massachusetts. He was Vice-President of the United States when he died.

Gers, a French department between Lot-et-Garonne on the N. and the Hautes and the Basses Pyrénées on the S., having Landes on the W. It is 75 miles long by 53 miles wide, and contains 2,425 square miles. It is generally hilly, especially in the S., where the Pyrenees send out spurs, some of which are 1,200 feet above sea-level, and enclose pretty valleys opening out at the mouth to a width of 3 or 4 miles. Most of the department lies in the basin of the Garonne, into which run the Save, Gers, Baise, etc., and the W. part is drained by the Adour. The climate is healthy, though changeable, and there is seldom snow or frost. Much of it is covered with wood, meadow, and heath, and a part is given up to vineyards. From the vine is distilled a brandy known as Armagnac. There are many cattle, sheep, mules, and poultry. Auch is the capital.

Gerson, JOHN OF (1363-1439), a noted chief of the University of Paris, and a man of great influence

in the General Councils of Pisa and Constance. He was born at Gerson in the Ardennes, and was sent to Paris to the College of Navarre at the age of 14. At 19 he became a Licentiate of Arts, and then studied theology under a noted professor. In 1384 he became a Bachelor of Theology, and in 1387 he was sent to the Pope at Avignon to plead the cause of one who had been expelled for disputing the doctrine of the Immaculate Conception. In 1392 he became Doctor of Theology, and in 1395 Chancellor of the University of Paris. He directed his efforts towards reformation in the Church, and was earnest in his endeavours to put an end to the Papal schism.

Gervase of Tilbury, so called from his birthplace (13th cent.), was an English priest and author. He went to Rome and other parts of Italy, and, after being ordained, studied law at Bologna. In 1177 he was present at the meeting of the Emperor Frederick and Pope Alexander III. at Venice. He then came to England, and here he wrote *Liber Facetiarum* for Henry, the crowned son of Henry II. After the death of this prince, he visited Sicily, and seems to have had a house at Nola. He then entered the service of the Emperor Otto IV., who made him Minister of the kingdom of Arles. It was at this period that he wrote his principal work *Otia Imperialia*.

Gervinus, GEORG GOTTLIEB (1805–1871), a German political and literary historian, was born at Darmstadt. In 1825 he went to Giessen to study philology, and in 1826 to Heidelberg, where he took Schlosser as his model. Between 1828 and 1830 he brought out an edition of Thucydides, and gave notes upon Blomfield's translation of the same author. In 1832 he went to Italy as travelling-tutor to a young Englishman. In 1833 he wrote some historical treatises, and was made professor-extraordinary, and was appointed professor at Göttingen, after the publication of a work upon the poetical literature of Germany. In 1837 appeared his *Grundzüge der Historik*, and in 1844 he was appointed honorary professor at Heidelberg. In 1847 he aided in founding the *Deutsche Zeitung*. He was a deputy to the National Assembly in 1848, and the hesitation of the then reigning Hohenzollern to adopt the views which were dear to Gervinus implanted in him a hatred of the dynasty which was never overcome, in spite of the events of 1866 and 1870. He retired into private life, and busied himself about his *Shakespeare*, which is highly esteemed in Germany, and has been translated into English. He also wrote a *History of German Literature*, and laid himself open to a charge of high treason and was condemned, but the sentence was quashed upon appeal. He also wrote a comparison between Handel and Shakespeare, which hardly found favour with his fellow-countrymen; but the *History of German Poetry* is generally considered his best work.

Gesenius, FRIEDRICH HEINRICH WILHELM (1786–1842), a German Orientalist and Biblical critic, was born in Hanover, and studied at the University of Helmstadt under Henke. He then

went to Göttingen, where he practised as a *privat-docent*. In 1811 he was appointed professor at Halle, where he taught and spent the rest of his life, save during the war of 1813–14, which closed the University, and two foreign visits which he made in order to carry on his researches into Oriental languages. He did much for Scriptural exegesis and for Semitic philology, and was greatly instrumental in putting Biblical criticism on a more scientific basis.

Gesner, CONRAD VON (1516–1565), a Swiss naturalist, sometimes called the "German Pliny," was born at Zürich, where he was brought up by an uncle, in whose garden he used to gather plants and imbibed his first taste for botany. He then went to Strasburg, to Bourges, and to Paris. In 1535 he was at Zürich, was married, and was in poor circumstances. He taught all day for his livelihood, and worked most of the night for love of science. In 1537 he was made Professor of Greek at Lausanne, and in 1541 Professor of Physics and Natural History at Zürich. He wrote upon ancient medicine and botany, and in a treatise upon milk he gave much information about Switzerland. Among many other classical labours, he published in 1545 his *Bibliotheca Universalis*, and from 1551 to 1587 appeared his *Historia Animalium*. He also projected a work upon botany.

Gessner, SALOMON (1730–1788), a Swiss poet and painter, was born at Zürich, where he spent his life as a bookseller. His first work to attract notice was *Lied eines Schweizers an sein Bewaffnetes Mädchen*. Then followed *Daphnis*, *Idyllen*, and *Der Tod Abels*, which was translated into English, and was often to be met with about the middle of the present century. His writings, like his paintings, belonged to the sentimental school of shepherds and shepherdesses and the like.

Gesta Romanorum, a collection of mediæval tales, which professed to be taken from Roman history, but were in reality fictitious. Probably the original series was really derived from Roman writers, but other tales were afterwards added, some of which can be traced to the *Clericalis Disciplina* of Petrus Alfonsus, a converted Jew of the 12th century, who was indebted to certain Arabian fabulists. According to the best authorities, the collection, as it has been handed down, was formed in England at the end of the 13th or beginning of the 14th century. An English edition issued from the press of Wynkyn de Worde in 1510–15. The tales are entirely devoid of literary merit, but they are interesting as having furnished material to many famous writers, including Gower, Parnell (in the *Hermit*), and Schiller, while others bear a close resemblance to Chaucer's *Man of Lawes Tale* and Shakespeare's *Merchant of Venice*.

Getæ are mentioned by Herodotus as one of the Thracian tribes. They dwelt on the north side of the Danube near its mouth, and are said to have crossed the river about the middle of the 4th century B.C. They afterwards united themselves with the Dacians, and proved a formidable adversary to the Romans till 106 A.D., when together

with the Dacians they were subdued by Trajan, and their territory became a part of the empire. They were subsequently overthrown by the Goths (q.v.), with whom they became blended.

Gethsemane, a farm or garden at the foot of Mount Olivet in the valley of Kedron, at a short distance from Jerusalem. It is chiefly noted as the scene of the Saviour's Passion, and some ancient olive-trees are said to mark the sacred spot.

Gettysburg, the chief town of Adams County, Pennsylvania, on the summits of several hills, 50 miles S.W. of Harrisburg. It is memorable as having been the scene of a battle (July 2-3, 1863), sometimes regarded as the most decisive of the War of Secession, between General Meade and the Confederate General Lee, in which the Federals were victorious. Several monuments commemorate the event.

Geyser (Icelandic *geysir* = "gusher"), denoting a fountain of steam and hot water discharged from holes in the ground in various countries, such as Iceland, North America, and New Zealand. The water may be clear and pure, or thick and muddy. The minerals held in solution may be sodium and potassium chlorides, calcium and sodium sulphates, various carbonates and silicates, etc. Such of these substances as separate by evaporations form a crater of solid matter around the orifice. The most wonderful are those near the Yellowstone river. One of these throws up at hourly intervals a column of water 6 feet in diameter to a height of 150 feet. The Icelandic geysers near Mount Hekla have been known since the 12th century. The pink terraces formed by the New Zealand geysers were famous for their beauty, but were destroyed in 1886 by volcanic eruptions. The phenomenon of geysers is associated with that of volcanoes. The eruptions are probably due to the intense heating of water far down in the funnel-shaped hole; the water cannot evaporate on account of the great pressure of the water above it that is at a temperature below boiling-point; but when, at more or less regular intervals, this superincumbent liquid is raised to the boiling-point by bubbles of steam that rise from below, it evaporates and causes the deeper liquid to boil with explosive violence.

Gfrörer, AUGUST FRIEDRICH (1803-1861), a German historian, was born in Würtemberg, and educated at the University of Tübingen. He went to Switzerland and to Rome, and afterwards established himself as a theological tutor at Würtemberg till 1830, when he was appointed royal librarian at Stuttgart. In 1835 he published a *Life of Gustavus Adolphus of Sweden*, and in 1838 a critical *History of Primitive Christianity*. From 1841-46 he brought out a *Church History down to the Fourteenth Century*. In 1846 he became a professor at Freiburg, and in 1848 was a member of the Frankfort Parliament. In 1853 he joined the Church of Rome. Among other works of his is a *Byzantine History*.

Gharial (Hind. *ghariyal*), either of the two species of the crocodilian genus *Garialis*, distinguished by their very long jaws, furnished with

very numerous teeth. The common gharial (*G. gangeticus*) from the Ganges is about 20 feet long, and feeds principally on fish and carrion. The second and smaller species (*G. schlegeli*) is from Borneo and Java, and the two are sometimes made a family. The usual but incorrect form garial is due to a misreading of *r* for *r*.

Ghâts, literally *landing-stairs* or *passes*, and in this sense they are used to signify the stairs by which pilgrims descend to the waters of the Ganges and other rivers, and to the steps which lead down to the tanks or artificial lakes so common in India; but generally the name is applied to two mountain ranges which run down the E. and W. coasts of India, and are called the Eastern and Western Ghâts respectively. The Eastern Ghâts are ranges with outlying spurs which pass down the Madras coast, beginning in Orissa and passing S. through Cuttack, then into the Madras Presidency at Ganjam, and still S. through Vizagapatam, Godaveri, Nellore, Chengalpat, S. Arcot, Trichinopoli, and Tinevelly. As a rule, they are at a distance varying from 50 to 150 miles from the coast, but at their entrance into the Madras Presidency the distance is very little. They are formed geologically of clay slate, hornblende, and limestone, overlying granite, gneiss, and mica slate. In height they average 1,500 feet, but in Ganjam rise to as many as 5,000 feet. The Western Ghâts start to the N. of the Tapti Valley, and go S. through Khandesh, Nasik, Tanna, Satara, Ratnagiri, Kanara, Malabar, the State of Cochin, Travancore, and meet the Eastern Ghâts at Cape Comorin. They are 1,000 miles long, and often nearly touch the shore, and at places they form bluffs and headlands jutting into the sea. On the W. are precipitous cliffs 3,000 feet in height, but on the E. they slope gradually to the plains. Mahabaleswar—a health resort to Bombay—is 4,700 feet high, and other peaks have a height of over 4,000 feet. S. of this place the height declines till Coorg, where it rises to 5,500 and 7,000 feet, at the spot where the Ghâts join the Nilgiri hills, and S. of the Palghât gap they are 7,000 feet high. Their geological formation is trap in the N. and laterite in the S. The Ghâts form watersheds, and in many places are clothed with primeval forest. Near Bombay the railway is carried by a wondrous engineering feat up the Borghât ravine.

Ghazali, ABU MAHOMED AL (1058-1111), a noted Moslem theologian, was born at Khorasan, and became professor of theology in the University of Bagdad. He afterwards went to Mecca, and then lectured at Damascus, Jerusalem, and Alexandria. He then returned to his native town, Tus, where he founded a Sufic College, and spent the remainder of his life in contemplation. He opposed the Arabic school of philosophers, and wrote among other works a commentary on the 99 names of God.

Ghazipur, a district and city in the N.W. Provinces of India. The district contains 2,168 square miles, and consists of a great alluvial plain, which is damp and hot. A railway passes through, and

here and there are lakes formed by old river-beds, the rivers having since changed their courses. The town is on the left bank of the Ganges, 44 miles N.E. of Benares, and extends for 2 miles along the river. Its productions are sugar, longcloth, tobacco, and rose-water, and it is the chief seat of the opium trade. Here is to be seen a ruined palace of the Forty Pillars, and Flaxman's statue of Lord Cornwallis, who died Governor-General of India in 1805.

Ghazni, a city of Afghanistan, was formerly the seat of empire, and played an important part in the early history of British India. It is on the high central table-land in long. 68° 20' E., and lat. 33° 34' N., at a height of 17,726 feet above sea-level, and on the road from Kandahar to Kabul, and on the Ghazni river. The climate is cold, and there is a good deal of snow. It was the capital of a native empire from the 10th to 12th century, and then came into the possession of the Sultan of Ghur, and passed afterwards to the Mongols and fell into decay. In 1738 Nadir, Shah of Persia, took it, and at his death it became Afghan. It was stormed by the English in 1839, by the Afghans in 1842, and retaken by the English in the same year. There are many ruins and monuments, among them being the tomb of Mahmud, and the tower of Mahmud.

Ghee, a clarified butter much used in India both as an article of food and for medical purposes. The milk is first boiled and then left to cool, curdled milk being added to cause coagulation. It is then churned for an hour, hot water being mixed with it at the end of the first half hour.

Gheel, a town in the province of Antwerp, 25 miles E. of Antwerp, in the Campine, and on the Herenthals and Moll railway. Its industries are unimportant, but the place is well-known, since for a long time past the neighbourhood has been the lunatic asylum or rather colony of Belgium. Tradition says that an Irish saint, Dymphna, took refuge here, and that at her church miracles of cure were wrought upon lunatics. Owing to the presence of so many pilgrims of unsound mind resorting hither, the inhabitants acquired a kind of hereditary faculty of dealing with such sufferers; and this fitness was officially recognised by Napoleon's prefect, M. Pontecoulant. In 1857 legislation, since supplemented, put matters on a definite footing. Some of the worst cases are, of course, confined and kept under constant medical supervision, but milder cases are distributed among the neighbouring villages, whose inhabitants take the lunatics as boarders, allowing them to share the labours, recreations, and other incidents of family life.

Ghent, or GAND, one of the most famous of the old Flemish cities, and the capital of East Flanders, is situated at the confluence of the Lys and Scheldt, 34 miles N.W. of Brussels. The town is built upon 26 islands, and is intersected by canals, which are crossed by 270 bridges. It is surrounded by gardens and meadows, and the old fortifications have been turned into boulevards. The older parts of the city are quaint, but the modern part has

nothing extraordinary. Among the notable buildings are the 13th and 14th century cathedral of St. Bavon, which contains Van Eyck's *Adoration of the Lamb*, the belfry 280 feet high without the top and containing the famed bell Roland, the 15th century hôtel-de-ville, which is a striking example of the period, the palais de justice, the university and the Béguinage where from 600 to 700 nuns live in separate cottage cells forming a small town. The chief industries are cotton, woollen, and linen manufactures, leather, lace, and sugar works, foundries and breweries, and there is a very extensive cultivation of flowers for export. A grand canal connects Ghent with the sea, but the mouth of the canal is in Holland. In 1007 Ghent came into the possession of Baldwin IV., and was made in the next century the capital of Flanders. By the 14th century it had so increased in importance as to provide an army of 80,000 men. The burghers were always noted for their turbulence, and had many a severe struggle with Charles the Bold and other of their rulers. In 1540 Charles V. took away their privileges, and from that time the town decayed. At the French Revolution it was made the capital of the department of the Scheldt, and in 1814 was included in the kingdom of the Netherlands, and became Belgian at the revolution of 1830. Our own John of Gaunt took his name from the town, and the Van Artevelde were among its most renowned citizens.

Gherkin, the fruit of a small-fruited variety of the cucumber (q.v.), *Cucumis sativus*, which is only grown for pickling.

Ghetto, the quarter of Italian towns in which Jews live, apart from the other citizens. Their isolation was formerly enforced by law. The term is sometimes applied to the Jewish quarter in other towns.

Ghiberti, LORENZO, an Italian sculptor (1378-1455), was born at Florence. He was first trained to his father's calling of goldsmith, but soon took to fresco-painting. When the plague attacked Florence, he went to Rimini, where he painted a fresco for Pandolfo Malatesta. Later the Florentines wished for bronze gates to the Baptistery to match one that had been executed by Andrea Pisano. A competition was instituted, and the successful designs were those of Donatello, Brunelleschi, and Ghiberti. Finally the work was entrusted to Ghiberti, and he set to work. The first gate took him 20 years to execute, and during this period the Council of Florence was held, and brought him new friends and patrons. The second gate, like the first, illustrated subjects from the Old Testament, and the two gates have a wide fame. Ghiberti also made statues of SS. John Baptist, Matthew, and Stephen for the church of St. Michael. He also wrote a commentary upon his art.

Ghika, HELENA, PRINCESS (1829-1888), was born at Bucharest, her father being Prince Michael Ghika. She received a classical education, and then travelled in Germany, France, and Italy, making herself acquainted with modern languages.

She wrote pieces for the theatre, and many other works, one of her chief aims, in which she was successful, being to wake up the Albanian people to a desire for freedom. Her marriage with a Russian prince, with whom she lived for a few years at St. Petersburg, was unhappy, and from 1855 she resided mostly at Florence. She wrote a good deal in reviews and magazines under the name of Dora d'Istria.

Ghilan, a Persian province forming part of the land between Elburz and the Caspian Sea, is bounded on the N. by Russian Caucasia, and contains 4,251 square miles. It is swampy and subject to inundations, but has good forests, and is very fertile, producing barley, wheat, rice, and fruits. The mulberry is largely grown for the silk manufacture. The fisheries are good. The climate is moist, unhealthy, changeable, and stormy.

Ghilyaks, a widespread people of North-east Asia, settled chiefly along the south side of the Sea of Okhotsk, in the island of Sakhalin and the Lower Amour river basin; present two distinct types—one Mongolic, with scanty beard, high cheek-bones, somewhat flat features, and yellowish complexion, the other marked by regular features and bushy beard, attributed by some to Russian mixture, by others to an original kinship with the Ainos of North Japan. [AINOS.] The latter is the more probable view, for they show a marked resemblance to the Ainos in speech, national usages, religion, and traditions, as well as in their physical appearance. There are two main divisions—*Kilé* or *Kileng*, the Kili-mi of the Chinese, and the *Kacheng*, with total population about 8,000, of whom 3,000 are in Sakhalin and 5,000 on the mainland. They live chiefly on the banks of the rivers and along the sea-coast, and are essentially a fishing people, though partly also engaged in hunting and trapping the fur-bearing animals of the surrounding woodlands. Most of the peltries are brought for sale to the Nicolayeff dealers. (J. Barnard Davis, *On the Skull of a Ghiliak*, in *Proceedings of the Anthropological Society*, iii., 1870; Dr. A. Anoutchine, *Memoirs of the Imperial Society of the Natural Sciences*, Moscow, vol. xx., Supplement.)

Ghilzaes (GHILJIS), one of the main divisions of the Afghâns, whose territory extends from the Khyber Pass to Kabul, and thence across the western spurs of the Sufed Koh ("White Mountains") to Ghazni, and down the Tarnak valley to Kandahar and the Pishin district on the Baluchistan frontier. There are two main branches—*Tûran* and *Bûran*, with about 120 Khels or septs variously enumerated, and total population 600,000 to 700,000. The Ghilzaes claim Turki descent, and according to the national traditions they entered the Ghor country, West Afghanistan, in the 8th century under Sebakhtakin, a Tatar of the Kilich tribe formerly located on the upper course of the Syr Daria (Jaxartes). From *Kilich* is supposed to be derived the national name *Ghilji* through an intermediate form *Kiliji*, meaning "swordsmen," "warriors." But no trace now remains of their Tatar origin, all having long been completely assimilated

in type and speech to the Afghân race. (Leech, *The Early Ghilzaes*, in *Journal of the Bengal Asiatic Society*, 1845; H. W. Bellew, *Afghanistan and the Afghâns*, 1879.)

Ghirlandajo, DOMENICO CALLED THE (1449–1494), was born at Florence. Brought up as a jeweller, he took to making portraits of every one he saw. In 1480 he painted St. Jerome and other subjects in a church, and a fresco of the Last Supper. In 1481–85 he worked at frescoes in the Palazzo Vecchio, and was then summoned by Sixtus IV. to Rome to aid in decorating the Sistine Chapel. Here he painted *Christ Calling Peter and Andrew* and other works. He then returned to Florence, and painted frescoes illustrating the life of St. Francis in the church of Sta. Trinita and incidents from the life of the Madonna and St. John Baptist for the church of Sta. Maria Novella. He introduced many historical and other portraits into his work. He is considered especially good in design and perspective, but his colours have suffered. RIDOLFO (1483–1561), son of the above, was also a painter of some note.

Ghomrian. 1. An Algerian tribe of Berber speech, S.W. of Milah, in the province of Constantine. 2. An Algerian tribe of Arabic speech, but originally Berbers, occupy the mountains skirting the right bank of the Sheliff near the Duperré district, in the province of Algiers. In their territory are the Roman ruins of Bu-Khirân.

Ghossel, a large Berber confederacy, province of Oran, Algeria, where they occupy both banks of the middle and lower course of the Isser tributary of the Tafna river. The chief allied tribes, all now of Arabic speech, are the Mediûna, Beni-Wazan, Zenâta, Shiha, Karâzba, and Uled Sidi-Abdelli, with total population 8,000.

Ghosts. [APPARITIONS.]

Ghoul, in Eastern mythology, a demon supposed to disinter and feed on the bodies of the dead.

Ghubri, a Berber tribe of Great Kabylia, province of Algiers, Algeria; occupy the right bank of the Bubehir or Upper Seban river, where Maknea is their chief settlement. Here are the Roman ruins of Ksar-en-Shebel.

Ghur, a mountain district of W. Afghanistan to the S.E. of Herat and N.W. of Kandahar, now in the territory of Herat. Little of it is known. It is inhabited by two races, known as Eimaks and Suris respectively, the former of whom rear many camels for the sake of their wool.

Ghuri, a dynasty that had struggles with Mahmud of Ghazni, and after their own defeat by the Mongols held Herat on sufferance.

Giannone, PIETRO (1676–1747), a Neapolitan historian, who sketched especially the growth of the papal power. He came to Naples when 18 years old, and in 1723 wrote his *Civil History of Naples*, the materials for which had taken him 20 years to collect. He was excommunicated, and went to Vienna, and then to Venice, and was driven from there to Geneva. Being captured by a trick

he was confined for life in the fortress of Turin. Gibbon, in his history, makes free use of Giannone.

Giant, a human being of considerably more than the ordinary stature. The average height of an adult Englishman is 5 ft. 7½ in., but individuals of 6 ft. are not uncommon amongst them; and this is an inch above the average height of the Patagonians, who are admitted to be the tallest living race. Thackeray stood 6 ft. 3 in., and his friend Mr. Higgins—the “Jacob Omnium” of the *Times*—some 4 or 5 in. more. But height that goes far beyond the average may generally be taken as the result of abnormal development which is associated with feebleness of mind and body, and almost invariably followed by premature decay and early death. There is no doubt, however, that a height of between 8 and 9 ft. has been attained, and it has possibly been exceeded. Patrick Cotter (1761–1804), exhibited under the name of O'Brien, is said to have been 8 ft. 7 in., but his memorial tablet in a Roman Catholic chapel in Bristol gives his height as 8 ft. 3 in. The skeleton of Charles Byrne, the “Famous Irish Giant,” in the museum of the College of Surgeons, measures 8 ft. 2 in., so that he probably stood at least 8 ft. 4 in. Winkelmaier, an Austrian, who was exhibited in London, and died in 1887, was probably nearer 9 ft. than 8 ft. The giants of Scripture seem to have been “mighty men” rather than men of extraordinary stature; and the height of Goliath, as given by Josephus, has probably been equalled in our own day. The arguments by which, from the days of St. Augustine to the beginning of the 19th century, it has been sought to prove from Scripture the gigantic stature of early man will carry little weight now. The giants of legend and mythology were beings far exceeding not only the stature, but also the strength and courage and craft, of ordinary mortals. The origin of the former may certainly be traced to the discovery of huge fossil bones at a time when the real nature of these remains was unknown, and giant-myths were invented to account for them; the latter may, with almost equal certainty, be said to be personifications of the powers of nature.

Giant's Causeway, a remarkable mass of doleritic or coarsely-crystalline basalt (q.v.) in county Antrim, on the north-east coast of Ireland. It consists of horizontal flows, so that the columns of the basalt, which are at right-angles to the surface of cooling, stand vertically. They are jointed horizontally, and have thus been eroded by weather and sea into a series of terraces and steps strikingly resembling a piece of Cyclopean masonry. The geological age of the basalts of this region, as indicated by leaf-beds between the lava-flows, seems to extend from the close of the Cretaceous period to the Miocene. Those of Staffa, Mull, and Skye, and some of those of Iceland, are of the same ages.

Gibbet, a kind of gallows, consisting of a wooden post with a projecting arm at the summit, from which criminals were suspended in chains and left hanging as a warning to others.

Gibbon, any species of *Hylobates*, long-armed, tailless Anthropoid apes, from the large islands of the Eastern Archipelago, Sylhet and Assam, Cambodia, the S. of China, and the island of Hainan. The body is very slender, and the fore limbs so exceedingly long that they reach nearly to the ground when the animals are erect, and there are hard patches of bare skin on the buttocks. The gibbons are arboreal in habit, swinging from tree to tree with their long arms, but they walk with difficulty, for the soles of their feet are turned inwards, which, however, enables them to grasp the boughs more firmly. They feed on fruit and leaves, are gentle in disposition, fairly intelligent, and have good memories. *H. syndactylus*, the Siamang, has the first and second toes united as far as the second joint and an air sac opening into the windpipe, whence it is sometimes placed in a separate genus (*Siamanga*). Other species are, the White-handed or Common Gibbon (*H. lar*), the Hoolock (*H. hoolock*), the Silvery Gibbon (*H. leuciscus*), the Agile Gibbon (*H. agilis*), and the Crowned Gibbon (*H. pileatus*). The Hainan Gibbon (*H. hainanus*) was first brought to Europe in 1892, and placed in the gardens of the Zoological Society.

Gibbon, EDWARD, was born at Putney on the 27th April (8th May, new style), 1737. So delicate was his constitution that his life was only preserved by the devotion of an aunt, who made him for years her peculiar care. In 1746 he was sent to school at Kingston-on-Thames, but was removed at the end of the next year on account of the death of his mother. A twelvemonth later he entered Westminster School, for which his aunt had opened a boarding-house. His studies were constantly interrupted by illness. He was hurried from place to place in search of health, and his real education took the form of desultory reading, which early turned in the direction of history. Upon his recovery, at the age of fifteen, his father sent him to Magdalen College, Oxford, where he arrived—to quote his own phrase—“with a stock of erudition, that might have puzzled a doctor, and a degree of ignorance, of which a school-boy would have been ashamed.” He found a total lack of discipline in the university, and almost as great a want of instruction. Left thus to his own resources, the boy turned eagerly to theology. Reading Middleton's *Free Enquiry*, instead of drawing the inference intended that the claim for a continuance of miracles discredited all miracles alike, he concluded that those of the early Church were genuine; and so, as has been well observed, he reached, at a bound, the position which, nearly a century later, the Tractarians attained by years of study. In the first Christian centuries he found the principles of Catholicism already taught, and felt himself compelled “to embrace the superior merits of celibacy, . . . the rudiments of purgatory in prayers for the dead, and the tremendous mystery of the sacrifice of the body and blood of Christ, which irresistibly swelled into the prodigy of transubstantiation.” When he reached this point, the theologian of fifteen began to study Bossuet, with

the result that on the 8th June, 1753, he was received into the Roman Catholic Church.

This was the turning-point of his life. He was sent to a Calvinist minister at Lausanne, who treated him with such tact that the articles of his Catholic creed "disappeared like a dream." Like a dream, however, disappeared also all higher impulse. Thenceforward Gibbon was known simply as an earthly-minded scholar, warm-hearted, but flippantly sceptical of every religious aspiration. He remained for five years at Lausanne, gaining a breadth of culture, through his knowledge of French, such as he could never have attained in England. Towards the end of the time he fell in love with Mdlle. Curchod, the daughter of a pastor, but finding that his father objected to the match, "sighed as a lover" and "obeyed as a son." This was the only ripple of passion which crossed the complacency of his egoism, and it was easily calmed. The lady seems to have retained hopes of the marriage until his next visit to Lausanne in 1763, when his coldness put it out of the question. She married the French minister, Necker, but retained a tender feeling for Gibbon until the end of his life. In a letter, written a month before his death, she spoke of "the sentiment which links my soul for ever to your own."

On his return to England, Gibbon lived partly at his father's estate in Hampshire, where he joined the militia. This force was embodied in 1760, and for two years Captain Gibbon was constantly in camp. In 1761 he published a treatise in French, *Essai sur l'Étude de la Littérature*, and was already meditating the employment of his powers upon some more serious task. Freed from the militia, he went abroad, spent nearly a year at Lausanne, studying the antiquities of Italy, and then visited Rome. It was on the 15th of October, 1764, that, while seated among the ruins of the Capitol and hearing vespers sung by friars in the Temple of Jupiter, he conceived the design of writing the history of the decline and fall of the city, which, however, he did not set about until four years later. Meanwhile he worked with his friend, Deyverdun, at the history of the Swiss struggle for independence, a subject which he finally abandoned. In 1767 and 1768 he helped the same friend to produce a periodical, *Mémoires Littéraires de la Grande Bretagne*, and in 1770 he brought out anonymously *Critical Observations upon the Sixth Book of the Æneid*, an attack upon Warburton's theory of Vergil's under-world. In 1774 he entered Parliament for Liskeard, and two years later published the first volume of the *History of the Decline and Fall of the Roman Empire*. Its success was immediate and startling, but the chapters upon the causes of the spread of Christianity created an outcry, which led Gibbon to bring out a *Vindication* in 1779. In the same year he was appointed to a sinecure office in the Board of Trade, in reward for his "sincere and silent vote" in favour of Lord North, and also, we may suppose, for a *Mémoire Justificatif* which he had drawn up in reply to a French manifesto. In 1780 he lost his seat, but re-entered Parliament as member for Lymington in 1781, in which year he published the second and

third volumes of his *History*. In 1782 his sinecure was abolished, and before long he determined to take up his abode with Deyverdun at Lausanne, a town which became his home for the remaining ten years of his life. In 1788 his fifty-first birthday (8th May) was marked by the publication of the last three volumes of the *Decline and Fall*. Upon this book Gibbon's fame must chiefly rest. Written with the imperfect views of the last century upon the development of civilisation, it has, nevertheless, kept its place without a rival. The project was vast, the ground untrodden, but the encyclopædic knowledge, the keen insight, and brilliant imagination of Gibbon enabled him to give a vivid and enduring picture of men and scenes, and a comprehensive summary of the ages of strife by which the modern world was shaped upon the ruins of the old. As an historian, Gibbon stands almost alone in the skill with which he groups the various parts of his book, and in his capacity for taking broad views of principles and actions while discussing the most minute points with the accuracy of a trained and careful scholar. His style, which in his youth completely fascinated Cardinal Newman, the greatest recent master of varied prose, although artificial and monotonous, is well adapted, in its stately and sonorous march, to the magnitude of the events which it describes.

Such was the great work of Gibbon's life, which, on its publication, was already drawing near its close. In 1793 he was in England, when the rapid development of a long-neglected evil (hydrocele) forced him to seek medical advice. It was, however, too late, and he died on the 15th January, 1794. After his death, his *Memoirs*—a brilliant, though incomplete, autobiography—were published by his friend, Lord Sheffield, together with his correspondence and a number of essays upon historical and classical subjects.

Gibbons, GRINLING (1648–1720), wood-carver and sculptor, was born at Rotterdam, but probably of an English family. He came to London and lived at La Belle Sauvage, where his wondrous carving of a pot of flowers attracted passers-by. He then executed ornaments for the theatre, and for Dorset Garden. He then went to Deptford, and here his copy of Tintoretto's *Crucifixion* attracted the notice of John Evelyn, who introduced him to Sir Christopher Wren, Samuel Pepys, and the king. Though his work did not gain direct approval at Court, the introduction brought him fortune. The king bought his *Stoning of St. Stephen*. The choir stalls of St. Paul's are his work, and there is much of it in other of Wren's churches. He also decorated Windsor, Whitehall, Kensington, Chatsworth, Blenheim, Petworth, and many other houses, and Trinity College Chapel, Oxford, and Belton Hall, near Grantham, have some of his best work. The wooden throne at Canterbury is also his work. His skill was particularly shown in depicting flowers, fruit, game, and still life generally; but he was also very successful in portrait medallions, and carved, too, in marble. From Charles II. to George I. he was the Court master-carver.

Gibbons, ORLANDO (1583-1625), composer, was born at Cambridge. He entered King's College choir in 1596, and worked his way forward till in 1604 he was organist of the Chapel Royal. In 1611 he first came before the world in conjunction with others, but in 1612 he produced madrigals and motets, among them being *The Silver Swan*. He wrote quantities of hymns, anthems, and other sacred music, and in 1625 wrote the music for the reception of Henrietta Maria at Canterbury by Charles I.

Gibbous means literally *hunched* or *hump-backed*, but the term can be used of any swollen or protuberant surface, and is applied in astronomy to the moon, when more than half full, the illuminated portion then having a convex appearance on both sides.

Gibbsite, a rather soft, grey to yellowish mineral usually occurring in stalactitic masses, sometimes in hexagonal crystals of the monoclinic system. It consists of hydrated alumina, and may be represented by the formula $H_6Al_2O_6$. It occurs in a number of localities in the United States, Brazil, the Urals, and Asia Minor. The name is also applied to a mineral of rather uncertain composition, which consists essentially of a hydrated phosphate of aluminium.

Gibel (*Carassius gibelio*), the Prussian carp. [CARP.]

Gibeon, in Palestine, was upon a hill in the plain a few miles N.W. of Jerusalem. The Bible relates the stratagem by which its inhabitants caused Joshua to think they came from a long distance, and so obtained a peace, to which, however, degrading terms were afterwards tacked. Here it was that the sun, as is said, stood still at the command of Joshua.

Gibraltar (Arabic *Jebel al Tarik*, Mountain of Tarik), the Calpe of the ancients, is a mountainous peninsula forming the southernmost point of Andalusia, Spain. To the northward is a low-lying isthmus, to the westward is Gibraltar Bay, and to the southward is the Strait of Gibraltar, which at its narrowest point is about 15 miles broad. The Rock of Gibraltar is grey limestone, rising to a height of 1,440 feet, and is inaccessible on the N. and E. On the N.W., upon the bay, lies the town, a place containing, with the garrison, about 25,000 inhabitants. The whole rock above the town is a network of galleries, and there, as elsewhere, there are formidable batteries, which are supposed to render the position impregnable. The town and fortress were founded about 710 by the Moorish chief, Tarik, and taken by the Spaniards in the 14th century. On August 4th, 1704, they were captured by an English expedition under Admiral Sir George Rooke. The place has since been repeatedly besieged, notably in 1779-82, when it was defended by General G. A. Elliot, but, being succoured with opportune supplies by the navy, has always successfully held out. Gibraltar is a garrison, not a colony, under the Colonial Secretary. It is governed by a general in the army, and usually contains between five and six thousand British

troops. There are two piers, one 1,100 feet and the other 700 feet long, and a good anchorage, but no dry-docks. The chief trade is in wine, spirits, tobacco, sugar, coffee, coal, and provisions, and the port is a free one. The already extensive fortifications have of late been largely added to, and now include rock-cut galleries mounting about 600 guns, the bastioned *enceinte* of the town, armed principally with 18- and 38-ton guns, and some very strong batteries to the S. of the town. The annual revenue of this important strategic possession is about £60,000. [BARBARY APE.]

Gibson, JOHN (1790-1866), sculptor, was born at Gyffin, near Conway. At seven years of age he used to draw animals from memory. He was apprenticed at 14 to cabinet-making, and then to wood-carving in Liverpool. His first attempt in marble was a head of Mercury, which led Messrs. Francis to try and get him from his apprenticeship. They finally succeeded, and William Roscoe took him up. In 1816 he exhibited at the Academy, and in 1817 he came to London, and went afterwards to Rome, where he made the acquaintance of Canova and Thorwaldsen, and stayed till 1844, meantime executing many works. He adopted Greek models, and introduced the practice of tinting statuary, a method which he declared to have been employed by the Greeks. His last work was a mantelpiece for Sir John Gladstone.

Gibson, THOMAS MILNER (1806-1884), an English politician, was born at Port of Spain, Trinidad, where his father, a major of the 37th Regiment, was stationed. He came to England, and went to school at Walthamstow, where he had for fellow-scholar Benjamin Disraeli. He graduated at Trinity College, Cambridge, in 1830, and entered Parliament in 1837 as a Conservative, but afterwards became a Liberal, and lost his seat. In 1841 he was returned at Manchester as an advocate of Free Trade, and in 1846 became a member of Lord John Russell's Ministry as Vice-President of the Board of Trade. He lost his seat in 1857, owing to the part he had taken in the Crimean War question, but was returned for Ashton-under-Lyne, which constituency he represented till 1868, after which he retired from political life. From 1859 to 1866 he was again President of the Board of Trade under Lord Palmerston. Mr. Gibson was well-known as a yachtsman.

Giddiness, VERTIGO, a feeling of instability, or of uncertainty as to the position of the body in relation to surrounding objects. Giddiness is sometimes associated with faintness, vomiting, and shortness of breath. It may be due to organic disease of the brain and especially of the cerebellum; to alteration in the quantity or quality of the blood-supply to the brain, as after loss of blood, in anæmia, in heart-disease, and the like; it occurs in megrim, epilepsy, and hysteria, and in association with disease of the stomach; giddiness also occurs as a result of disease of the larynx, "laryngeal vertigo," and as a symptom of certain affections of the ocular muscles. The form of giddiness due to disease of the semicircular canals, "auditory

vertigo," will be dealt with under the heading **MENIÈRE'S DISEASE**. A peculiar form of giddiness is sometimes brought on when the patient enters a large open space; to this form the term "Agoraphobia" is applied.

Giddings, JOSHUA REED (1795-1864), an American anti-slavery politician, was born at Athens in Pennsylvania. He went to Ohio, where he was called to the bar in 1820, and returned to the Legislative Assembly in 1826. From 1838 to 1859 he sat in Congress, and in 1842 he underwent a vote of censure for his views on slavery. He resigned his seat, and was re-elected by his constituents. In 1861 he went as consul-general to Canada, where he died. His published works are *Speeches*, *The Exiles of Florida*, and *The Rebellion: its Authors and Causes*.

Gideon, a famous Judge of Israel, who freed his country from the raids of the Midianites and Amalekites. His history is set forth in the Book of Judges (q.v.).

Giessler, JOHANN KARL LUDWIG (1792-1854), a German writer on Church history, was born at Petershagen, near Minden. He went to the University at Halle, and took military service in 1813-15. His first work, published in 1818, attacked and demolished the idea of a primitive gospel. In 1819 he was Professor of Theology at Bonn, and he lectured and wrote there on Church history. In 1824 he published the first volume of his *Church History*. In 1833 he went to Göttingen, and there were published two further volumes of the *History*. The fourth, fifth, and sixth were published after his death. He visited, during his lifetime, England, Edinburgh, and New York.

Giessen, a town in Hesse-Darmstadt, 33 miles N.N.W. of Frankfurt, with a population of 13,858, situated at the point where the Lahn joins the Wieseck. It was formerly fortified, but is now notable for the school of chemistry, which owes its reputation to Liebig (q.v.), and is the chief feature of its university.

Giffen, ROBERT (b. 1837), an able statistician, was born in Lanarkshire, and was in his early years engaged in commerce at Glasgow. Having had some slight journalistic experience in Scotland, he came to London in 1862. He became assistant-editor of the *Economist* and the *Fortnightly Review*, and was for some years city editor of the *Daily News*. In 1876 he became head of the Statistical Department of the Board of Trade, and held that post till 1881. He has published *Essays in Finance* (1879, 1886), and *Stock Exchange Securities* (1878).

Gifford, WILLIAM (1757-1826), first editor of the *Quarterly Review*, was born at Ashburton, Devon, and, having been left an orphan, was at first sent to sea, and then apprenticed to a shoemaker. He found, however, a patron in a surgeon named Cookesley, by whose help he was sent to Oxford. He next acted as tutor to Earl Grosvenor's son. During his subsequent literary career in London he became editor of the *Anti-Jacobin* and the *Quarterly* (1809-24). He wrote the *Bariad*

and the *Mæriad* satires; translated Juvenal; and edited Massinger, Ben Jonson, Ford, and Shirley. He enjoyed two successive Government appointments, and was buried in Westminster Abbey. He was the last representative of the "correctness" in poetry chiefly associated with the name of Pope.

Gift (*donum*, *donatio*) is the transferring of the property in anything by one person to another voluntarily and without any consideration. The giver is called the donor, and he to whom the gift is made the donee. By the common law an estate might pass as a gift by livery of seisin without deed, but by the Statute of Frauds, 29 Charles II. c. 3, a deed or note in writing is rendered necessary to the transfer of real estate. To complete a gift of goods and chattels delivery of them is necessary, for until then the transaction is not properly a gift but a contract, and the English law will not compel a man to perform his contract unless it is founded upon what is called a good and valuable consideration. Gifts are sometimes declared void as against creditors and purchasers for a valuable consideration. There are some few cases where, in respect of the nature of the interest itself, its transfer is absolutely prohibited—*e.g.* the pay of a military or naval officer, or the salary attached to any public office of trust, is, on a principle of public policy, not assignable. Again, the dealing with a public appointment is contrary to the policy of the law, and is prohibited in most cases by express enactment of the Legislature, and for a like reason the assignment of alimony is illegal. [CONSIDERATION, BANKRUPTCY.]

Gigue, a short piece of music formerly popular as a dance tune, and often forming part of a longer composition. In the corrupted form *jig* the word survives as the name of the dance itself.

Gijon, or XIJON, a seaport of Spain, in the province of Asturias, 20 miles N.N.E. of Oviedo. There are some fine buildings in the town, which carries on a brisk export trade in fruit and filberts, and imports colonial produce. A naval school and a public library are also among its institutions.

Gila Monster. [HELODERM.]

Gilbert, SIR HUMPHREY, English navigator, half-brother of Sir Walter Raleigh, was born in 1539 at Greenway, on the Dart, was educated at Eton and Oxford, served with the army in Ireland in 1570, and fought in the Netherlands. In 1578 he was granted a patent to establish settlements abroad, and made his first voyage. In 1583 he went with five ships to take possession of and settle Newfoundland, and on the return voyage in the *Squirrel*, of 10 tons, he was lost. He wrote a very eloquent and learned discourse on the North-West Passage.

Gilbert, SIR JOHN (b. 1817), a celebrated historical painter, was born at Blackheath. He exhibited his first picture (a water-colour) in 1836 at the Suffolk Street Gallery, the subject being *The Arrest of Lord Hastings by the Protector, Richard*,

Duke of York, and from this time onwards continued to send oil-paintings to the British Institution and the Royal Academy. He was knighted in 1871, in which year he was also elected President of the Society of Painters in Water Colours. He became A.R.A. in 1872, and R.A. in 1876. Among his earlier works were *Don Quixote giving Advice to Sancho Panza*, *The Education of Gil Blas*, and *Othello Before the Senate*. He has painted many Shakespearean scenes, and contributed to illustrated editions of many English classics. Among his more recent paintings the best are, perhaps, *The Doge of Venice in Council* (1876), *King Henry VII.* (1880), *The Morning of Agincourt* (1884), *Sir Launcelot* (1887), and *Ego et Rex Meus* (1889).

Gilbert, WILLIAM (1540–1603), one of the earliest natural philosophers of England, was born at Colchester. Having graduated and become fellow of St. John's College, Cambridge, he practised medicine in London, and became physician to Elizabeth and James I. In 1600, when he was made president of the College of Physicians, he published his *New Physiology of the Magnet and Magnetic Bodies, and the Earth as a Great Magnet*. In this book, which was highly praised by Bacon, he investigated and illustrated the properties of the magnet, and showed their application to navigation. His collection of books, globes and instruments, bequeathed to the College of Physicians, perished in the Great Fire of 1666. Of him Dryden wrote, "Gilbert shall live till loadstones cease to draw."

Gilbert, WILLIAM SCHWENCK (b. 1836), the best English satirist of the latter half of the 19th century, was born in London, at whose university he graduated. He was called to the Bar in 1864, and was a clerk in the Privy Council Office from 1857 to 1862. Early in his literary career he wrote for *Fun* the *Bab Ballads*, which have subsequently appeared in book form. He has produced numerous comedies and dramas, among which the most notable were the *Palace of Truth* (1870), *Pygmalion and Galatea* (1871), and *Dan'l Druce* (1877). *The Happy Land* (1873) was a political satire on three members of the then Liberal Ministry. But even the best of these did not mark him off from his contemporaries as did *Sweethearts* (1874), *Engaged* (1877), and still more the librettos which he wrote for Sir A. Sullivan's comic operas *Trial by Jury*, *Princess Ida*, *The Sorcerer* (1877), *H.M.S. Pinafore* (1878), *The Pirates of Penzance* (1880), *Patience* (1881), *Iolanthe* (1882), *The Mikado* (1885), *Ruddigore* (1887). *The Yeoman of the Guard* (1888) and *The Gondoliers* (1890) had more of pathos and less of satire, but were equally successful with the rest. In 1892 Mr. Gilbert furnished the book for Mr. A. Cellier's comic opera, *The Mountebanks*.

Gilboa, a range of hills in northern Palestine, between the valley of the upper Jordan and the plain of Esdraelon. In this neighbourhood Saul and his sons were defeated by the Philistines and met their death.

Gilchrist, ALEXANDER (1828–61), the biographer of Blake, the poet and artist, was born at Newington Green. He was called to the Bar in 1849, but practised hardly at all, giving his energies to literature instead. After some contributions to periodicals he wrote a *Life of Etty*, which appeared in 1855. Soon afterwards he went to live in Chelsea, where Carlyle was his next-door neighbour. His *Life of Blake* was unfinished at his death, but was completed by his widow (*née* Burrows) and published in 1863. Both husband and wife were intimate with the Rossettis. Mrs. Gilchrist, who died in 1885, wrote a *Life of Mary Lamb*, and edited the second edition of *Blake* (1880). Her own *Life and Writings* were published by her son (1887).

Gildas, the supposed author of *De Excidio Britanniae*, a history of Britain from the birth of Christ till 560, is thought by some to have been born about 520, by others some years earlier. He was probably a British monk, and is said by an early biographer to have gone to Brittany in his thirtieth year, and there to have founded a monastery and written his book (first printed in 1525). His death is placed at about 570. Alcuin called him "the wisest of the Britons," and Bæda made great use of his writings. In the monastery of St. Gildas, near Vannes, in Brittany, Abélard sought refuge. There are translations of Gildas's work by Jos. Stevenson (1838) and Dr. Giles (1841). Their historical value has been impugned by Gibbon and Sir J. Duffus Hardy, but defended by Dr. Gnest.

Gilding is the art of adorning a surface by covering it with gold. It was practised by the ancient Egyptians, and is often referred to in the Old Testament. It became common at Rome after the Punic Wars. The various methods now employed fall into three main divisions—mechanical, chemical, and encaustic gilding.

Mechanical Gilding is employed to attach gold-leaf to wood, paper, plaster-of-Paris, etc. A wooden picture-frame first receives a coat of oil-paint, and then several coats of whiting mingled with glue, which are successively smoothed with pumice-stone and sand-paper. The portion to be burnished is then covered with animal size, while gold-size is applied to the remainder. The frame is now ready to receive the gold-leaf, which is laid on with the broad thin brush named *tip*, and afterwards made to adhere more closely by means of a softer and thicker brush. When there is much raised ornament, whiting is not used, as it tends to wear away the outline. Two methods are followed in fixing gilt ornaments to a japanned ground. It is either coated with gold-size before receiving the gold-leaf, or isinglass is used to make the gold-leaf adhere. In the latter case a larger part of the surface is covered, and asphaltum is employed to paint the ornament, as it preserves the gold beneath it when the rest is removed by washing. In the "false gilding" now practised in Germany silver-leaf or tinfoil with a coating of yellow varnish is substituted for gold-leaf.

Chemical Gilding. Electro-gilding is now the

ordinary means of gilding metals [ELECTRO-METALLURGY], but other methods are still employed. *Wash or fire gilding* is effected by applying an amalgam of gold to the surface; the mercury is then volatilised, and a film of gold remains fixed to the metal. *Gilding by immersion* consists in applying a solution of gold in nitro-muriatic acid, the acid attacking the metal and setting free a corresponding amount of gold, which adheres to the surface. After both of these processes the object is coloured by covering it with a saline composition, and then applying "gilding wax," a mixture of beeswax and ochre, which is afterwards burnt off.

Encaustic Gilding is used for glass, pottery, and porcelain. The gold is precipitated with sulphate of iron or dissolved in *aqua regia*, the acid being removed by the application of heat. The powdered gold is then mixed with one-twelfth of its weight of oxide of bismuth, and a little borax and gum-water. This mixture is applied to the article with a camel-hair brush, and at first has a dingy colour, but the gold lustre is brought up by burnishing with agate and bloodstone.

Gilead ("region of rocks"), a tract of mountainous country east of the Jordan, extending from the Yarmuk on the N. to the borders of Moab and Ammon on the S. The geological formation is of dark-grey limestone towards the summit, and of sandstone lower down. Oak and terebinth forests clothe the slopes of the mountains, and the valleys abound in vegetation. The district was assigned by Joshua to the tribes of Reuben and Gad and the half tribe of Manasseh. Laurence Oliphant wished to colonise it with Jews, and wrote a description of it (*The Land of Gilead*, 1880).

Giles, ST., who has given his name to so many churches, is thought to have lived in the 7th century A.D. He was an Athenian of good birth, who gave away all his possessions, and lived first at Arles and afterwards in the desert country in its neighbourhood. Here he is said to have lived in a cave upon the milk of a hind, and to have been traced through her by the King of France, who made him abbot of a monastery. The festival of St. Giles, patron of lepers, beggars, and cripples, is on September 1. He is often known by his Latin name, Ægidius.

Gilfillan, GEORGE (1813-1878), a Scottish writer and critic, was born at Comrie, Perthshire. In 1835 he became minister of the body afterwards known as the United Presbyterian Church (U.P.'s), and officiated at the Wynd Church, Dundee, for more than 40 years. He displayed ability both as preacher, lecturer, and writer, and just before his death received from his fellow-citizens a public testimony of their esteem. His best-known work is the *Gallery of Literary Portraits*, which appeared at first in the *Dumfries Herald*. *The Bards of the Bible* reached a seventh edition in 1887. Among his other works were lives of Scott and Burns and *Sketches, Literary and Theological*, the two latter of which were posthumous.

Gill, JOHN (1697-1771), a Baptist divine and controversialist, was born at Kettering, Northants.

He taught himself Hebrew and the classical languages, and was a minister in London from 1719 till his death. He defended the authenticity of the *Song of Solomon* against Whiston, and wrote an *Exposition of the Old Testament* (republished with a memoir in 1810), an *Exposition of the New Testament*, and several other didactic and controversial works.

Gillespie, GEORGE (1613-48), a celebrated Presbyterian divine, was son of the parish minister of Kirkcaldy. He took an active part in the resistance to Laud's attempt to force the English service-book on the Scots, and in 1643 attended the Westminster Assembly as a representative of the Presbyterians. He wrote an able work, called *Aaron's Rod Blossoming*, in defence of Presbyterianism, and was made Moderator of the General Assembly just before he died.

Gillray, JAMES (1757-1815), a caricaturist of great merit, was born in Chelsea. He was at first a strolling player, then became a successful engraver, and from 1779 till four years before his death devoted his talents to caricature, chiefly of a political character. He at first ridiculed George III. and the Court, but, when induced to desist from attacking them, made Fox and Napoleon his chief subjects. He was his own engraver. He led a very irregular life, and in 1811 became insane. Several collections of his caricatures have been made, notably that by Thomas Wright, which accompanies the *Life and Times of Gillray* (new edition, 1873).

Gills, or BRANCHIÆ, are the respiratory organs of aquatic animals. Since they occur in many classes, their form and arrangement is very various; essentially, they consist of a portion of the body wall covered by a thin membrane, beneath which there is a network of blood-vessels, the object of this arrangement being to facilitate the aëration of the blood. The surface of the gill is often thrown into complex folds, so that the surface exposed to the water is much increased.

Gilpin, BERNARD (1517-83), an English reformer, called "the Apostle of the North," was born at Kentmire, Westmoreland. He was educated at Oxford, where he was converted to Protestantism by the preaching of Peter Martyr. After studying at Louvain, he was appointed Archdeacon of Durham and rector of Easington, and distinguished himself as a zealous reformer. He next became incumbent of Houghton-le-Spring, whence he was hurried to London by order of Bonner on a charge of heresy. He was saved from the stake by an accident which befell him on the journey, and meanwhile Queen Mary died. He was offered by Elizabeth the see of Carlisle and the provostship of his old college (Queen's), but preferred to remain in his parish. He obtained a general licence to preach, and made use of it in all the northern counties with great success.

Gilthead, any species of Chrysophrys, a genus of Sea Breems, with about twenty species, from tropical and sub-tropical seas. The body is oblong and compressed, and covered with moderate-sized

scales ; the spines of the long dorsal can be received into a groove. *C. aurata* from the Mediterranean, which was kept by the Romans in their vivaria, occasionally strays to our southern coast. It is about a foot long, silvery-grey above with golden bands on the sides, steel-blue below. There is a brilliant-coloured spot between the eye, whence the generic name (=golden eyebrow). The Giltheads feed principally on molluscs.

Gil Vicente (flourished 1500), an early dramatist, called the "Portuguese Plautus," the model of Calderon and Lope de Vega, was born at Barcellos, and died at Evora. He produced in all 42 plays, about half of which are written both in Spanish and Portuguese. They were first published complete in 1562, and were reprinted at Hamburg in 1834.

Gimbals are arrangements for supporting magnetic compasses or other instruments in a horizontal position. They consist of two sets of pivots at right-angles to each other, fixed in circular brass hoops surrounding the instrument, which can oscillate in one direction by being pivoted to the inner ring, and in a direction at right-angles to the first by being pivoted with the inner ring to the outer one. If the centre of gravity of the supported instrument be well below the level of the pivots, it will remain with the same horizontal aspect, however irregularly the outer framework may be tilted.

Gin, an alcoholic liquor obtained from grain. The raw alcohol obtained from this source is redistilled, then flavoured with the necessary material, which varies according to the brand, quality, etc., and again redistilled. For the flavouring a large number of substances are employed, as *e.g.* angelica root, calamus root, sweet fennel, juniper, cinnamon, liquorice, etc. It is usually of strength about 20 "under-proof," and may not be sold below 35 "under-proof" [PROOF SPIRIT.] When pure it should be perfectly clear and colourless. Sweetened gin is produced by the addition of small quantities of pure sugar syrup to the liquor. *Hollands gin* is a Dutch brand very largely imported into Great Britain, which is obtained from barley-malt and usually flavoured with juniper.

Gingelly Oil. [SESAME.]

Ginger, the rhizome of *Zingibar officinale*, a perennial monocotyledon, probably native to tropical Asia, but now cultivated throughout the tropics. It occurs in commerce in two forms—"coated," retaining a brown wrinkled epidermis, and "uncoated," or scraped and dried or bleached. This bleaching is effected by sulphur fumes or chloride of lime, or the ginger is often actually whitewashed with whiting or plaster-of-Paris. The best quality is that from Jamaica. Our total imports vary from 1,600 to 3,500 tons annually. The chief constituents of ginger are starch, a volatile oil to which the odour is due, and a resin which gives it its pungency. The younger shoots (or "green" ginger) are preserved in syrup as a sweetmeat; but the Chinese preserved ginger is mainly the product of the Galangal (q.v.).

Ginger-beer Plant, a remarkable substance acting as the fermenting principle in home-made ginger-beer, occurs in yellowish-white, semi-transparent, gelatinous lumps, and consists of a yeast-plant, *Saccharomyces pyriformis*, the cells of which are symbiotically entangled by a coiled schizomycete, *Bacterium vermiforme*.

Ginger-grass Oil, known in North and Central India as RUSA OIL, and in Egypt as IDRIS OIL, is also called OIL OF GERANIUM (q.v.). It is obtained from the sweet-scented grass *Andropogon Schœnanthus*, and is used medicinally in India, as hair-oil by Arabs and Turks, and in Egypt to adulterate attar of roses (q.v.).

Ginkgo biloba, often known as *Salisburia adiantifolia* or the maidenhair tree, is the only species of a genus, belonging to the Yew tribe (*Taxineæ*), native to Japan and Northern China. It reaches a large size; has leaves of a unique shape, exactly like maidenhair, only thicker, with a long stalk and a bi-lobed, truncate, broadly cuneate blade; and bears a seed as large as a plum, though not seeding in England, where it is otherwise hardy.

Ginseng, the root of *Panax Ginseng*, a plant belonging to the ivy family, cultivated in Corea and Manchuria, and valued in China as a medicine, being sold at from 6 to 400 dollars an ounce. Its forked form may have suggested its possessing properties conducive to virility as in the case of the mandrake (q.v.); but it has, in fact, no active principle or medicinal action. The roots of another species, *P. quinquefolium*, are imported into China as a substitute from the United States.

Gioberti, VINCENZO (1801–1852), an Italian philosopher and political writer, was born at Turin, and educated for the priesthood. He was made chaplain by Charles Albert on his accession to the throne of Sardinia, but two years later was imprisoned and then banished on account of his liberal opinions. He went to Brussels in 1834, where for eleven years he was teacher of philosophy in a school, and devoted his leisure to his favourite studies. His *Introduction to the Study of Philosophy* (1839–1840) was Platonic in tendency. After publishing some essays, he began to concern himself with less abstract subjects, writing several political works. Of these *The Moral and Civil Primacy of Italy* proposed a confederation of Italian princes, with the Pope as their head and the King of Sardinia as protector. In 1848, when he returned to Italy, he was received with open arms by his countrymen, was elected representative for Turin, and subsequently became President of that Chamber and Prime Minister of Sardinia. He soon, however, resigned office, and went on a mission to Paris, where he settled and published his work on *The Civil Renovation of Italy* (1851). Although he wrote a book against the Jesuits, and some of his works were placed in the *Index Expurgatorius*, Gioberti was by no means a heretic, and his earliest work was a defence of the supernatural.

Giordano, LUCA (d. 1705). an Italian painter of very great facility but little imagination, and one of the most prolific artists that ever lived. His nickname of *Fa Presto* ("Make haste!") is said to have arisen from a frequent exclamation used by his father in the days of his son's popularity. The latter was born at Naples, industriously copied the great masters at Rome and Venice, and assisted Pietro da Cortona, whom he imitated. Madrid, Dresden, and Naples possess the greatest number of his works. He painted in fresco the ceiling of San Lorenzo and the Escorial; and at his native place are to be seen *Christ Driving the Dealers from the Temple* (in S. Filippo Neri) and *St. Francis Xavier Baptising the Indians* (in the museum). *Cupid and Psyche*, a series of twelve pictures, is at Hampton Court.

Giorgione ("Big George"), the name by which Giorgio Barbarelli (d. 1511) is generally known, was a great painter of the Venetian school. He was born near Castelfranco, and studied with Titian under Giovanni Bellini. He settled at Venice, where he soon acquired great fame, and was employed to paint portraits of Gonsalvo di Cordova and two doges. He executed also many frescoes, the most famous of which are those painted in 1506-7 on the façade of the Fondaco de' Tedeschi, opposite the Grand Canal. Much of his work has perished, and many pictures by other artists, such as Sebastiano del Pionbo, Schiavone, and several painters of the Brescian and Friulian schools, have been attributed to him. Giorgione was probably less than 40 at his death. He was buried at his native place, whose church possesses a *Virgin and Child* by him. At the Pitti Palace, Florence, is *A Concert*, and the National Gallery of London has *A Knight in Armour* and *The Birth of Christ*. Giorgione followed Bellini in his landscapes, and excelled in all the chief beauties of the Venetian school. Titian greatly admired him, and was influenced by his style; and to him some critics even attribute *The Concert*. Vasari says that Giorgione was a skilful singer and lute-player; if so, it is a presumption in favour of his having been the creator of this great work. *The Sleeping Venus* of the Dresden Gallery remains unchallenged.

Giotto (1266?-1337), the great Florentine painter and architect, was the son of a peasant named Bondone, living at the village of Colle. At an early age he was a pupil of Cimabue (q.v.), and probably assisted him at Assisi. About the year 1291 he was invited to Rome by Cardinal Stefaneschi, where the *Noricella* in the portico of St. Peter's is probably his work. Returning to Florence some two years later, he painted the chapel of the Podestà or Bargello, and in the *Paradise* series of frescoes inserted portraits of Dante, Corso Donati, and Brunetto Latini. At Padua Giotto decorated the Scrovegni Chapel in the Arena Church with 38 frescoes. Dante visited him here, and is thought to have suggested subjects to his friend. The painter now probably wandered from city to city. He is known to have been at Naples in 1333, and the fresco series there called the *Seven Sacraments of the Church* have been attributed to him. At

Assisi he painted a series of 28 frescoes illustrating the life of St. Francis, and treated the same subject later in the chapel of the Bardi, in Santa Croce, Florence. His work here was until recently covered by whitewash. As master of works of the cathedral and city he designed the famous Campanile, his last work. Giotto married, and had six ugly children, and many anecdotes of him have come down to us from Boccaccio and others. Among others is the story which has given rise to the Italian expression "as round as Giotto's O." When asked by a messenger of the Pope to give a specimen of his skill, the painter is said to have drawn with a pencil dipped in red colour "a circle so perfect and exact that it was a marvel to behold." Giotto is referred to in the *Purgatorio* of Dante (canto xi.). He was the first great Italian painter who studied nature instead of following tradition. He first gave expression to faces, and laid on colour with a light hand. His numerous pupils, the Giotteschi, carried on his work in the same spirit. Mr. Ruskin, who contributed the letterpress to the engravings of the Arena frescoes, is never tired of dwelling on the merits of this master.

Gippsland, so called from Sir George Gipps, an early Governor of New South Wales, is the south-eastern division of Victoria, Australia. It has an area of 13,898 square miles. The chief town is Sale. Mining and agriculture employ the inhabitants.

Giraffe (*Giraffa camelopardalis* = *Camelopardalis giraffa*), an African ruminant from the south of the Sahara, sometimes classed with the deer, but more generally placed in a family by itself. Sir Richard Owen considered that its position was between the hollow-horned and the solid-horned ruminants, though partaking more of the nature of the latter group. The adult male is the tallest of living animals, standing from 16 to 18 feet high. This great height is principally due to the very long neck, which, however, has but the usual number of vertebræ (7), though these are excessively elongated. The back slopes considerably from the shoulder to the rump, and gives one the impression that the fore limbs are much longer than the hinder ones. The elevation at the shoulder is really due to the prolongation of the neural processes of the dorsal vertebræ which serve as points of attachment for the muscles of the neck. This will be readily seen on examining a skeleton or a picture of one. The dentition is like that of oxen, and the tongue is prehensile and capable of extension, so that these animals can easily procure the leaves which form their food. Each limb has but two digits, and there are no false toes. The giraffe has two small, solid, persistent horns, covered with skin and hair, and a bony protuberance in the middle line of the face, appearing in old animals as a third horn. The colour is a lightish fawn, with darker spots and blotches, the under surface is white. The species is vanishing, and there is even now great difficulty in procuring specimens.

Giraldus Cambrensis, a Welsh writer whose real name was Gerald de Barri, was born at a castle

in Pembrokeshire about 1146. After studying at Paris he was ordained, and as Archdeacon of St. David's distinguished himself by the activity with which he collected tithes and attacked abuses. In 1176 the see became vacant and the long struggle of his life began. His object was to become bishop and to secure the ecclesiastical independence of Wales. He was twice nominated by the chapter and was elected in 1198, but, though he appealed to the Pope, he was deposed and a Norman bishop appointed. Meanwhile he had become one of Henry II.'s chaplains, and in 1184 accompanied Prince John to Ireland. Two of his books, the *Topographia* and *Expugnatio Hibernica*, give an interesting description of that island at this period. Giraldus read them in public at Oxford. He was offered every Irish see and also those of Bangor and Llandaff, but declined them all. In Wales he was a kind of national hero, but was opposed by the immoral clergy and the Norman barons. He seems to have been a favourite of King John, but the influence of Archbishop Walter was used to prevent his advancement. His preaching of the crusade in Wales had been very effective, and in Paris he drew large audiences to his lectures on canon law. He died somewhere about the year 1216. His *De rebus a se gestis* is a fragment of autobiography, and he left several other works, including a *Description of Wales*, *Itinerarium Cambrie*, and the lives of several mediæval saints and bishops. The whole have appeared in seven vols. in the Rolls Series, edited by Brewer and Dimock.

Girard, STEPHEN (1750-1831), a philanthropic miser, was born near Bordeaux, and after filling every successive rank in the American coasting service, finally settled at Philadelphia. Here he made a fortune and established a bank, which advanced large sums to the Federal Government during the war of 1812-14. He was very mean, if not dishonest, in his private transactions, but was none the less a public benefactor. He nursed those who were sick of yellow fever in 1793, and left a large sum for the building and endowment in Philadelphia of a college for orphan boys. The establishment was to be strictly unsectarian, and was limited to whites. There were more than a thousand pupils in 1886.

Girardin, ÉMILE DE (1806-81), a French journalist, nicknamed for his political instability "La Girandole" (weathercock), was born in Paris, the natural son of Alexandre de Girardin and Madame Dupny. His *Émile* (1827) dealt with conditions of birth similar to his own. Next year he became Inspector of Fine Arts, and now began to found several popular journals, the most successful of which was *La Presse*. His principles were summed up in the motto "Au jour le jour." He killed the editor of the *National* in a duel. So far as he had any consistency, he was a republican, and opposed Louis Napoleon's *coup d'état*. From 1862 to 1870 he edited the *Liberté*, and in 1874 founded *La France*. He was for some years a strong Socialist. His dramas were not successful, unlike those of his wife (his first, *née* Delphine

Gay), author of several tragedies in which Rachel acted, and comedies, and of *Lettres Parisiennes*. She had a brilliant salon, but died as early as 1851.

Girardin, FRANÇOIS SAINT-MARC (1801-73), French journalist and writer, was born at Paris. He had a brilliant student's career, and in 1834 was appointed Professor of Literature at the Sorbonne. In 1844 he was elected to the Académie Française, having published works on German education, politics, and literature. His most popular work was the *Cours de Littérature Dramatique*, which attained an 11th edition. His contributions to the *Journal des Débats*, in which he wrote Orleanist articles, also appeared in collective form. He was a member of the Assembly from 1834 to 1848 and again after the fall of the Second Empire.

Girder is an iron or timber beam capable of supporting great loads. The applied load should never be greater than one-third of the breaking load. A girder intended to carry moving loads such as those that traverse a bridge requires to be differently designed from those that only carry stationary loads. Girders should be well supported, and, if of great length, provision should be made for expansion due to temperature. It is usual in such cases to fix one end by pivoting, and to let the other end rest on a small carriage supported on a number of small steel rollers. Cast-iron girders have been employed for some years, and are very convenient in many cases, but for heavier work the advantage of wrought-iron girders has caused their introduction, such being generally built up of two parallel booms one above the other and a somewhat slender web or lattice-work connecting them. The booms themselves are also built up of wrought-iron plates, the number of plates necessary at any one part of the girder depending upon the bending and shearing stresses at that part. Thus in a long plate girder supported at the ends and loaded uniformly, the stresses tending to produce bending are greatest at the middle and the booms are therefore made thickest at that part by superposition of wrought-iron plates riveted together. The stress tending to produce shear at any section diminishes towards the middle. It is usual to design the web or lattice so that it shall stand the shear stress, and for stationary loads on the above girder the lattice must be stronger towards the extremities. It should be noticed that the upper boom is compressed on loading and the lower boom is extended. Wrought iron can stand tension and compression equally well, so that the top and bottom booms are made of the same sectional area. Solid cast-iron girders, on the other hand, have to be made with the bottom flange about five times the area of the top flange, for cast-iron stands five times as much compressive stress as tensile. Increasing the distance apart of the booms increases also the power of the girder to resist bending, so that for the girder to be of uniform strength throughout its length, there is no need to vary the thickness of the booms towards the middle if instead they are there arranged farther apart. The ordinary bow-string girder (q.v.) illustrates this arrangement.

Girders that are fixed at one end and free at the other are called *cantilevers*, and with these it is usual to arrange pairs of cantilevers end to end so that they may balance each other. The Forth Bridge gives the finest example of the use of cantilevers, the spans being built of huge cantilevers 600 feet in length with their free ends pointing towards each other and arranged to carry a steel girder of the ordinary type between them. In the cantilever the bending stresses increase from the free extremity towards the fixed end. The booms are therefore made widest apart at the piers. [BRIDGES, article and plate.]

Girgeh, the capital of a province in Upper Egypt of the same name, is on the left bank of the Nile, 60 miles N.W. of Thebes. Here the Mamelukes fought Mehemet Ali. There are several mosques, and the oldest Roman Catholic monastery in Egypt.

Girgenti, near the site of the ancient Agrigentum, is a town on the S.W. coast of Sicily, 60 miles S.S.E. of Palermo. It has a cathedral, a castle, and a harbour. Rather more than a mile from the city are the ruins of several Greek temples. Corn is stored in caverns and exported from Porto Empedocle.

Gironde, a department in the S.W. of France, on the Biscay coast S. of the estuary of the same name. Its area is 3,760 square miles. Low sand-hills or dunes, flanked by lagoons, lie along the coast. The chief rivers are the Dordogne and Garonne, and Bordeaux is the capital. There is much vine-cultivation and some corn-growing, but there is also a good deal of waste land. Large quantities of salt are obtained from the lagoons. The trade in wine and fruits is facilitated by the Canal du Midi. The manufactures include wax candles, chemicals, sugar, porcelain, and tobacco. The climate is mild and damp.

Girtin, THOMAS (1775-1802), a painter of landscapes in water-colours, was born in Southwark, and early made the acquaintance of J. M. W. Turner. He began to exhibit at the Academy in 1794, his first subjects being architectural. Mr. Ruskin considers that Turner owed much to him. Most of his drawings are in private hands, but there are examples of his art both in Bloomsbury and at South Kensington. His panorama of London was being exhibited at the time of his death, which took place soon after his return from Paris, where he drew and etched some fine sketches.

Girton, a college for the higher education of women, founded at Hitchin in 1869, and removed to Girton, near Cambridge, in 1873. It is under the superintendence of a "Mistress," and five lady lecturers reside in the college. The other lecturers are for the most part members of the university, and the students enter for the public examinations at Cambridge. "Degree certificates" are given to successful candidates.

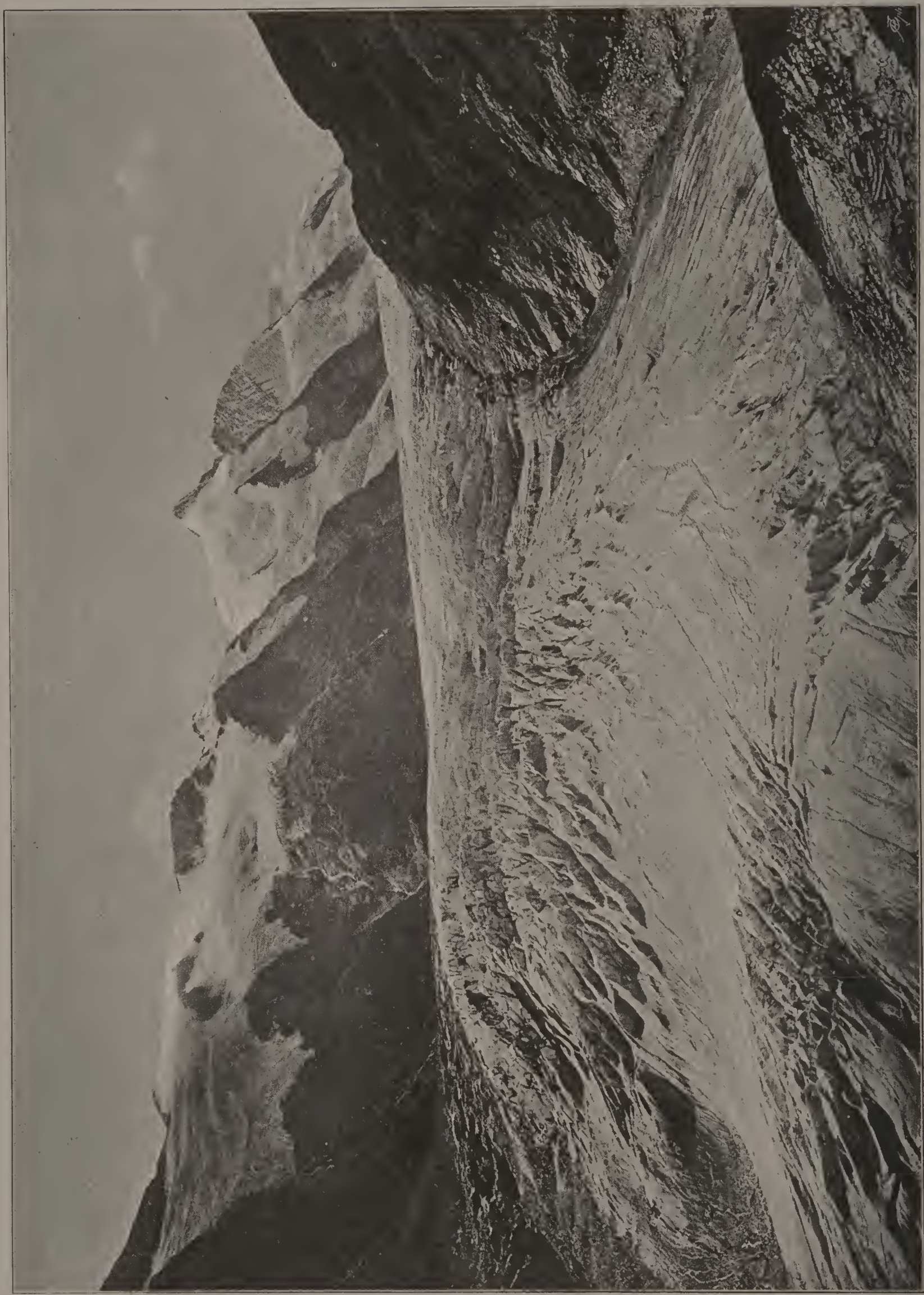
Girvanella, a peculiar organism which builds minute twisted calcareous tubes, which have often served as the basis of oolitic grains. It has been

described as a calcareous alga, but is probably one of the Foraminifera (q.v.).

Giulio Romano (d. 1546), the name generally given to GIULIO DEI GIANUZZI (sometimes also called PIPPI), Raphael's best pupil, was born at Rome between 1490 and 1500. He was apprenticed to Raphael in his early youth, and assisted the master in the Vatican. As one of his executors he also received some of his implements and works of art. Though known as "the Roman," Mantua was the scene of much of his best work. Here in the Palazzo del Té he executed his great fresco *The Defeat of the Giants*, and also decorated the cathedral and the ducal palace with similar works. He was about to go to Rome to take up the position of architect of St. Peter's when he died. Giulio was an engineer as well as painter and architect. He drained the marshes round Mantua and protected it from inundations. Of his pictures *The Martyrdom of St. Stephen* is at Genoa; Florence (the Uffizi) has his own portrait and several other works; the Louvre contains *Venus and Vulcan*, *A Nativity*, and other examples; and in the National Gallery is *The Infancy of Jupiter*. At Rome there are several of his Madonnas and the work in the Vatican (*The Battle of Constantine*, *The Apparition of the Cross*, etc.), which he completed for Raphael. Connoisseurs award him much of his master's spirit, but not his grace.

Givaros (JIVAROS, XIVAROS), a powerful Indian nation of Ecuador, where they occupy the forests on the eastern slope of the Andes along the banks of the Paute and other northern headwaters of the Amazons. They are a tall, vigorous people, very fierce and warlike, occupied chiefly with fishing and hunting, and also raising large herds of swine. In battle and on festive occasions they wear attached to a long tress of the hair the heads of the enemy slain by their own hands, prepared with much skill and reduced to about the size of a large apple by extracting all the bones from their integument. The usual arms are iron and wooden spears and darts, besides the blow-pipe, with which poisoned arrows are shot to a great distance with surprising accuracy. The dress is reduced to a simple loin-cloth, dyed a deep yellow, and the whole body is usually painted a yellowish-red and streaked with long black lines. The Givaro language is extremely harsh, and entirely different from the Kicina, which is the current speech of most of the other Indians in the eastern parts of Ecuador. Hitherto these primitive wild tribes had kept entirely aloof from the whites and other settled populations; but about 1870 some French missionaries penetrated amongst them, and established a central station at Gualaquiza on the Rio Rosario, 95 miles S.E. of Cuenca. (*Annales de la Propagation de la Foi*, September, 1871.)

Gizeh (*Ghizeh*), a town in Egypt, capital of a province of the same name, stands on the W. bank of the Nile, nearly opposite Cairo. Artificial egg-hatching has been carried on here from time immemorial. Five miles to the W. are the Pyramids (q.v.).



PASTERZE GLACIER AND GROSS GLOCKNER (CARINTHIA).

Glacial Period, the earlier portion of the Pleistocene (q.v.) period, during which a gradual refrigeration of climate, of which we have evidence in the mollusca of the Pliocene, became intensified in the northern hemisphere until an ice-cap descended from the pole into the centres of Europe and North America, to Saxony in the one case and to about lat. 39° N. in the other. The underlying rocks, where hard enough to retain them, show not only polished surfaces, but striæ, evidently the work of land-ice, mainly in one direction in each district. In the thick accumulation of "till" or unstratified boulder-clay (q.v.), which commonly rests on these polished and striated surfaces, the boulders derived from a distance are found to have come from the direction indicated by the striæ. The ice-cap seems to have been from 6,000 to 7,000 feet thick in Norway, filling the Baltic, the German Ocean, and the Irish Sea; 5,000 feet in the north-west of Scotland; and nearly 1,500 feet in the Harz. Scandinavian boulders are frequent in the boulder-clay of East Anglia. The southern margin of the sheet seems in Europe to have passed from the neighbourhood of Nijni Novgorod and Kieff across Galicia and Silesia to the Riesen-Gebirge and Erz-Gebirge, the Harz, Hanover, Holland, the Thames, and the Bristol Channel. That of the American sheet is marked by a series of mounds or kames that have been traced from the coast of Massachusetts for over 3,000 miles across the continent.

Beds of peat and stratified sands and clays occurring at various levels in the boulder-clay, and containing the bones of land animals, point apparently to various prolonged episodes of a more genial climate known as *interglacial periods*. Thus, whilst owing to the cold we find the arctic species of birch and willow far south of their present limits, *Pecten islandicus* and other arctic shells in Scotland, the woolly mammoth (q.v.) in Italy, the reindeer in Switzerland, and the musk ox in the Pyrenees, during these warmer periods we find plants of temperate latitudes migrating to Siberia, and the hippopotamus, lion, hyæna, and porcupine travelling northwards into Central Europe.

Whilst during the culmination of the Great Ice Age or period of first glaciation, much of north-west Europe seems to have been at a higher level relatively to the sea than it has ever occupied since, it seems afterwards to have been lowered beneath an ice-laden sea, until shells could be deposited at least 1,350 feet above present sea-level on Moel Tryfaen in North Wales. Then an upward movement to existing levels took place with long pauses, during which the various lines of *raised beaches* (q.v.) were formed, which fringe the coasts of Scotland and Norway. Before the close of the Great Ice Age man seems to have appeared in Europe, for his flint implements occur with the bones of arctic animals in Central France and beneath glacial deposits in various parts of England.

Glacier is a stream of ice that flows down the valleys in high alpine regions by its own weight and by pressure of snow from above. In warmer

climates they must be sought for at high altitudes, about 16,000 feet near the Equator, from 1,000 to 2,000 feet in New Zealand, and from 4,000 to 6,000 feet in Switzerland; but in higher latitudes, such as Greenland, the ice comes down to sea-level. Icebergs are formed by fracture of the ice sheet as it passes into water. There remains much to be discovered concerning the nature of glaciers. It is generally in motion, the rate of progress varying much with the locality. Valuable experiments were made on the *Mer de glace* near Chamonix by Forbes, Tyndall, and others. It was found that this particular glacier moved at an average rate of 1 foot 10 inches per day. In Greenland 21 feet per day is a fair average. As with rivers of water, the rate of motion at the sides is less than that in the middle on account of retardation by friction. Similarly where the bed is narrowest the glacier is generally deepest. A steep glacier flows more rapidly than one of gentle slope. If the bed is ridged along its length, more or less parallel cracks or *crevasses* appear on the surface. When the ridges are transverse, the crevasses are transverse. If the bed is much broken, both longitudinal and transverse crevasses may occur. It is probable that sharp depressions in the bed produce crevasses on the under surface of the glacier, which is thus rarely continuous throughout its mass. Sudden lowering of the bed produces an *icefall*, the glacier here being broken up into pinnacles and irregular blocks separated by crevasses of great width and often profound depth. Fresh snow may in many cases cover the crevasses, but unless the snow is very thick slight depressions of its surface will indicate the positions of the hidden crevasses. It is probable that the curiously continuous flow of glaciers is due to the process of regelation first pointed out by Forbes; ice under pressure is liable to become liquefied, and will freeze again when pressure is removed. If, therefore, the stream of ice has to pass over an obstruction, pressure from behind will cause partial liquefaction of those parts that are subjected to the greatest stress; flow is thereby rendered easier, and after the obstruction is passed the ice becomes solid again. A glacier is fed by snow from high altitudes forcing its way down the hollows first as hard snow or *névé*, but gradually hardening under pressure until it becomes ice, and tributary streams may unite and so form the main glacier. Where it leaves the steeper parts of the mountain its weight will generally cause fracture, and crevasses that are technically termed *bergschrunds* will mark off the glacier from the *névé* or steeper ice.

Depending upon various conditions of the glacier, crevasses in their passage downwards with the ice become more or less oblique; they may close up or may become enlarged.

Moraines are heaps or lines of stones and boulders that have fallen upon the glacier and have been carried down by the stream of ice. Medial moraines lie along the centre line of the glacier. Lateral moraines lie along its edges. Terminal moraines are carried forward to the lower end of the glacier, and sometimes pass far down into the valley. When two glaciers meet, it frequently happens that

two of their lateral moraines meet, forming a medial moraine down the main glacier. Moraine heaps may be so great as to hide all traces of glacier, and it is sometimes difficult to tell whether ice exists under the mass of boulders.

Temperature conditions assign a lower limit to the glacier, which may thus change in position. Though the glacier never flows backwards, its lower extremity or snout may seem to do so by being dissolved away more rapidly than the ice stream creeps downwards. Fluctuations in the length and depth of glaciers are observed to take place in periods extending over many years. The plate facing page 65 shows a glacier at a period of shrinkage.

Many watercourses may be carved out in the glacier, vertical plunges or *moulins* occurring where the water falls down perpendicular shafts in the ice, these probably starting initially as crevasses and wearing down under the action of the water. Lake basins may also be occasionally formed in the ice, and present a source of danger in critical situations, where the ice walls enclosing them are not sufficiently strong to withstand the fluid pressure. The catastrophe of 1892 at St. Gervais in the Haute-Savoie is partially explained by this fact.

Gladbach, a town in Rhenish Prussia, 16 miles W. of Düsseldorf. It was formerly the centre of a linen trade, but now chiefly manufactures cotton. Other industries are bleaching, dyeing, paper-making, and brewing. The town is very old, and has a church some parts of which date from the 8th century. Mönchen-Gladbach is to be distinguished from Bergisch-Gladbach, a much smaller place, 8 miles N.E. of Cologne, where drag-nets are made, and there are zinc-works.

Gladiator, one who fought in the amphitheatre at Rome with a sword (*gladius*) for the amusement of the people. The first gladiator show held at Rome was that given by Marcus and Decimus Brutus in 264 B.C. on the occasion of their father's funeral. After they became a form of public entertainment they usually took place in the amphitheatre. Under the emperors they increased greatly in number and magnificence, as many as ten thousand gladiators being exhibited in honour of Trajan's victory over the Dacians. They were finally suppressed by Theodoric (500 A.D.). Gladiators were usually slaves, captives, or condemned criminals, but under the emperors senators, knights, and even women, took part in the combats. Before a show took place, a bill was displayed, giving particulars concerning the contests. The gladiators engaged in a preliminary combat with wooden swords, before the real struggle began. They were called by different names, according to their dress and equipment and the manner in which they fought. When a gladiator was wounded, he was at the mercy of the spectators, who could save his life by turning down their thumbs or cause his instant execution by pointing them upwards. Palms were awarded to the victorious combatants.

Gladiolus, the name of a genus comprising about 90 species, belonging to the Iris family,

native of South Africa and the Mediterranean regions. They have fleshy corms, sword-like, distichous leaves (whence their name), and spikes of showy, monosymmetric flowers with a funnel-shaped, curved, or arched perianth-tube, and three stamens placed posteriorly. The slender style divides into three petaloid stigmatic segments, much as in *Crocus*. The plants grow three or four feet high, are perennial, can be multiplied by off-sets from the corm, and hybridise freely, so that a multitude of sorts are in cultivation.

Gladstone, RIGHT HON. WILLIAM EWART, was born in Liverpool in 1809. He was educated at Eton and Christ Church, Oxford, where he was one of the most brilliant opponents of Reform and Emancipation; and it was as a Tory that he was elected for Newark in the first reformed Parliament (December, 1832). He soon made himself a position in the House, and in two years was made a Junior Lord of the Treasury by Sir Robert Peel. A year later he became Under-Secretary for the Colonies. In the second Peel Ministry he was successively Vice-President and President of the Board of Trade, and the revised and reduced Customs Tariff of 1842 was understood to be mainly his work. But he resigned in 1845 on the question of the proposed Maynooth grant, to which he was opposed. In the previous year he had been entrusted with the carrying of the Railway Bill, which provided for cheap trains and permitted the erection of electric telegraphs. He now retired from Parliament for a year; and thus was brought to a close his first period—that of “firm and unbending Toryism.” The second, commencing with his election for Oxford University (1847), was one of transition. So long as his old chief lived, Gladstone did not call himself a Liberal. The measures, however, which he supported were of a truly liberal nature—the Removal of Jewish Disabilities, the Repeal of the Navigation Laws, and, above all, the Abolition of the Corn Laws. As Colonial Secretary he had also to do with the changes that were made in the government of dependencies. In 1851, a year after the death of Peel, he definitively separated himself from his old associates, and became Chancellor of the Exchequer (December, 1852) in the coalition of Whigs and Peelites under Lord Aberdeen. His speech on the affairs of Greece in 1850 had finally established his position as one of the first of living orators; and his attack on Disraeli's Budget two years later proved his great ability as a financier and brought about the fall of the Derby Government. His first Budget speech enhanced his reputation, and in the Palmerston Cabinet, which succeeded the coalition, he continued to hold the Chancellorship. Considering himself, however, bound to oppose inquiry into the conduct of the Crimean War, he retired with the other Peelites in a few weeks. Mr. Gladstone also opposed Palmerston's Chinese policy, and joined the Conservatives in defeating the Conspiracy to Murder Bill. In 1858 he was sent to Corfu as High Commissioner to negotiate for the reunion of the Ionian Islands to Greece. For a third time, during the years 1860–1866, he was Chancellor of the

Exchequer, first under Palmerston and then under Earl Russell. During this period he carried the Post Office Savings Bank Bill, the Repeal of the Paper Duties, and some remissions in taxation rendered possible by the commercial treaty with France. He now also first came into collision with the House of Lords, and emerged triumphant. In consequence of his growing Liberalism he lost his seat for Oxford University, and had to migrate to South Lancashire. In 1865, when Russell became a peer, Mr. Gladstone became, for the first time, leader of the Liberals in the House of Commons. In that capacity he introduced but failed to carry a Reform Bill, while in opposition he effected the abolition of Church Rates, and carried a resolution in favour of the Disestablishment of the Irish Church. On this question the General Election of 1868 was fought; and, though Gladstone lost his seat for South Lancashire, his party won the day, and, being elected for Greenwich, he became Prime Minister. During the six years which followed, the Irish Church Act (1869), the Education Act and the first Irish Land Act (1870), and the Ballot Act (1872), were placed on the Statute-book; and the purchase of commissions in the army was abolished by royal warrant. The settlement of the *Alabama* claims by arbitration made the Ministry somewhat unpopular, and the Irish University question (on which Mr. Gladstone had long changed his views) proved fatal to it. The Liberal Premier resigned, but resumed office until the General Election, when, being defeated, he went into opposition. During the early days of the Conservative Administration he laid down the leadership of his party, but was roused by accounts of Bulgarian atrocities to enter upon a fervid denunciation of Lord Beaconsfield's foreign policy. In the General Election of 1880 he attacked and carried the Conservative constituency of Midlothian, and, having obtained a majority in the constituencies, became First Lord of the Treasury and Chancellor of the Exchequer. He resigned the latter office three years later, and had his first serious illness in the autumn of 1884. In 1881 was passed a Coercion Bill, and, after a struggle with the House of Lords, a second Irish Land Bill; but the Irish were not conciliated, and the Phoenix Park murders were followed by a Prevention of Crimes Act and an Arms Act, giving further powers to the Irish executive. The Arrears Act, another attempt at conciliation, was also passed. The Egyptian question was yet more thorny than the Irish. The rebellion of Arabi was crushed, and Alexandria bombarded; but revolt in the Soudan followed. Hicks Pasha was defeated and killed; and General Gordon, when sent out, was poorly supported, and finally perished at Khartoum before the relieving expedition could reach him. Frequent votes of censure were moved in the Commons, and some of them nearly carried. Meanwhile, a new Franchise Bill was brought forward and carried through the Commons, but was rejected by the Lords, because not coupled with a Redistribution of seats. A violent agitation followed in the autumn (1884), but a compromise was arrived at, and the Redistribution scheme appeared early in 1885. After the passing of these measures, which had temporarily

reunited the Liberal party, dissensions again broke out, and the defeat on the Budget question in May, 1885, was looked upon as a welcome deliverance. The Conservatives (in a minority) held office till after the General Election of 1885, when Mr. Gladstone obtained their defeat on the Allotments question, and for a third time became Premier. He held office for a few months only, as his change of opinion on the Irish question alienated some of his supporters. The Home Rule Bill of 1886 was defeated, and the country ratified the decision of their representative. Now followed six years of Anti-Home Rule Government, during which Mr. Gladstone, in spite of his years, continued to lead the Opposition. In the General Election of 1892 he was triumphant, and for the fourth time became head of the Government.

Mr. Gladstone's activity has not been confined to the realm of politics. As a zealous Churchman he has written on the relations of Church and State, has attacked Romanism (*The Vatican Decrees* (1875); *Vaticanism* (1875)) as a political force; and has done battle with the Agnostics. In 1858 he published *Studies in Homer*, and has written similar works on the subject in defence of the personality of the poet and the unity of the works attributed to him. *Juventus Mundi* appeared in 1869. Though severely orthodox in his theological views, he incurred defeat by supporting the claims of Mr. Bradlaugh to affirm instead of taking the Oath, and attempting to pass an Affirmation Bill.

Gladstone's Law, in *Optics*, is the statement of a connection between the refractive index of a transparent medium and its density. It states that the excess of the refractive index above unity of any such substance, whether solid, liquid, or gaseous, is proportional to its density. If μ be the refractive index and ρ its density, then for the one substance $\frac{\mu-1}{\rho}$ is a constant quantity. It may be deduced from physical considerations if the substance be supposed to consist of refracting molecules of constant indexes distributed through the ether, their average distance apart depending upon the density of the substance.

Glagolitic, an old Slavonic alphabet, so called from *glagol*, the name of the letter *G*. The letters are of peculiar form, quite different from those of the ordinary Slavonic alphabet invented by the apostles Cyril and Methodius. They are of uncertain origin, being attributed by some to St. Jerome, by some derived from the cursive Greek script, and by others connected with an old Albanian system of which nothing further is known. None of these hypotheses have met with general acceptance; but while the problem of origin remains unsolved, it appears certain that Glagolitic is older than Cyrillic. At least the language of the old Glagolitic MSS. is of more archaic form, and all Slav palimpsests show the Cyrillic written over the Glagolitic texts. At present Glagolitic, being of somewhat rigid form, is little used, and mainly restricted to the religious writings of the Dalmatian Slavs. (Dr. M. Gaster, *Ilchester Lectures on Greek*

and *Slaronic Literature*, London, 1887; Canon Isaac Taylor, in *Archiv für Slavische Philologie*, v. p. 191.)

Glaisher, JAMES (b. 1809), the founder of the Meteorological Society, was born in London. In his youth he was employed in the Irish Ordnance Survey, and was three years in the Cambridge Observatory. In 1840 he was made superintendent of the meteorological department of the Greenwich Observatory, and held that position till 1874. In conjunction with Mr. Coxwell, the aeronaut, he made numerous balloon ascents, and once reached a height of nearly seven miles, the greatest yet attained. On this occasion he nearly lost his life. He has written several scientific works, and completed the Factor Tables of Burckhardt and Dase.

Glamorganshire, a southern county of Wales, having the Bristol Channel on the S. and S.W., Brecknockshire on the N., Caermarthen on the N.W., and Monmouthshire on the E. Its area is 855 square miles. The northern part of the county is hilly, and is a rich coal-field. The southern is composed of fertile valleys, among them the beautiful Vale of Glamorgan, and has a soil favourable for the growth of corn. The chief rivers are the Taff, the Neath, and the Tawe, and the largest towns Merthyr-Tydvil, Swansea, and Cardiff. Ironstone, anthracite, and limestone are among the minerals obtained from the soil. There is also good pasture-land, and much butter and cheese is made. The castles of Oystermouth and Caerphilly date from the Middle Ages, and Roman remains are to be seen. The county of Glamorgan is represented by five members of Parliament.

Glance. A number of minerals, chiefly the "sulphides," are designated by the name "glance"—*e.g.* copper glance, silver glance, cobalt glance, etc. The term is derived directly from the German *glanzen*, to shine or glitter, and is therefore only applied to certain substances which exhibit a high lustre.

Glanders, FARCY, EQUINIA, a disease which especially affects the horse tribe, but occasionally occurs in man and some other animals. It is characterised by the appearance of nodules in the mucous membrane of the respiratory tract (particularly that of the nose), the lymphatic glands are also affected, and the skin is sometimes involved. (Farcy buds, *see* FARCY.) The nodules and tubercles shortly after their first appearance begin to break down, and ulcers are formed which exude a viscid purulent secretion. The onset of the disease is heralded by considerable febrile disturbance, and the animal affected becomes prostrate, and may die within a few days, more usually, however, after the lapse of a fortnight or three weeks. In the horse, and occasionally in man, the course of the malady is much prolonged, and these cases of chronic glanders are sometimes followed by recovery. Glanders has been in recent years shown to be a germ disease; the specific organism is called the *bacillus mallei*. Glanders is one of the diseases of animals that comes within the scope of the Contagious Diseases (Animals) Acts. There is no doubt that much may be done in the way of preventing

the spread of the malady from diseased to healthy animals (prompt removal and destruction of glandered horses, disinfection, etc.). The disease is especially prevalent in London at the present time (1893), sometimes as many as fifty horses being destroyed by it in the course of one week. The stamping out of the malady is of importance, not only on account of the ravages which it works in the horse tribe, but also to obviate the danger which the prevalence of the equine disease implies to stablemen, coachmen, and others, who are by the nature of their avocations brought into contact with horses.

Glands. 1. A secreting gland in its simplest form consists of a folding in of a mucous membrane, forming a kind of pocket or tubular depression, lined by a series of epithelial cells (secreting cells) which are continuous with the epithelium of the mucous membrane. Each depression is surrounded by a network of capillary blood-vessels, and the secreting cells abstract from the blood the material which they elaborate, and then pass it on into the tubule to be discharged as the secretion of the gland. The glands of the stomach, the glands of Lieberkuhn in the intestines, and the sweat glands, may be cited as examples of such simple tubular glands. In the compound tubular glands (salivary glands, pancreas, Brunner's glands of the duodenum, and mammary glands) the structure is more complicated; there are a series of main tubes which divide and subdivide, the whole series of tubes being lined as before with epithelium, but the function of secretion is limited to the ultimate divisions of the system of tubes, the main channels serving merely to conduct the secretion to the surface, and being called ducts. A third group, the aggregate or racemose glands, may be alluded to; in these each main duct branches out into a series of vesicles or acini, constituting what is termed a lobule, the whole gland being thus made up of a system of lobules. The meibomian glands of the eyelids may be given as an example of this type of structure. The term gland is sometimes applied to certain structures in no way allied to the ordinary secreting gland—*e.g.* the lymphatic glands, thymus gland, pineal gland, etc. (Glands, diseases of, *see* LYMPHATIC GLANDS.)

2. Glands, in *mechanical Engineering*, are collars of metal surrounding cylindrical pieces, such as piston-rods, for the purpose of keeping them in place. They are frequently made to act as covers for stuffing-boxes, in which oil-soaked asbestos-rope, or other lubricative packing, is compressed so as to make an air-tight joint, through which the cylindrical rod may move. [STUFFING-BOXES.]

Glanvill, JOSEPH (1636–80), an able writer who defended the belief in witchcraft, was born at Plymouth and educated at Oxford. He was at first a Nonconformist, but after the Restoration obtained several Church benefices, and was rector of Bath Abbey for 20 years. He was also chaplain to Charles II., and Prebendary of Worcester. A friend of Baxter, Cudworth, and More, he was one of the first fellows of the Royal Society. His fame rests

upon *The Vanity of Dogmatising* (1661), in which was anticipated the invention of the electric telegraph, and Hume's theory of causation; and *Skēpsis Scientifica*, a reissue of it, in which he advocated scientific as opposed to scholastic methods of reasoning. In his *Sadducismus Triumphatus* (1671), and in a previous work, he made an ingenious attempt to prove the existence of witches, and maintained that a disbelief in them necessarily involved atheism. He himself thought he had heard spectral drummings and seen supernatural manifestations in the house of a Mr. Mompesson, at Tedworth, Wiltshire.

Glanville, RANULF DE (d. 1190), justiciar of England in the reign of Henry II., and reputed author of the Latin treatise on *The Laws and Customs of England*, is said to have been born near Saxmundham, Suffolk. As sheriff of Lancashire, he was one of the leaders of the army which defeated the Scots at Alnwick (1174), and after holding several other positions of trust he was named justiciar (or chief minister) in 1180. He was of great use to Henry in the war with his sons, and when Richard I. came to the throne he fined him and made him go on crusade. He died before Acre. The legal treatise is sometimes ascribed to his nephew, Archbishop Hubert Walter (q.v.).

Glarus, one of the Swiss cantons, situated between Schwyz and St. Gall, and bounded on the south by Grisons. The river Linth, rising in the Tödi-berg, flows north-eastward to the lake of Wallenstadt, which is connected by means of a canal with the lake of Zürich. The canton is mountainous except in the north, the Tödi, 11,765 feet in height, being the highest point. Pasturage is good, and schabzieger, a green cheese, is made. In the valleys much fruit is grown. The area of the canton is 267 square miles. Glarus, where Zwingli preached for some years, is the capital. Protestants form a large majority of the population.

Glaserite consists of sulphate of potassium, K_2SO_4 , which occurs naturally in thin prismatic crystals, especially in the neighbourhood of Vesuvius. It is also known by the name of "arcanite."

Glasgow, the largest town in Scotland, and the second in Great Britain, stands on both sides of the river Clyde. The greater part of it is in Lanarkshire; but it also overlaps Renfrewshire in the south-west. It is 45 miles from Edinburgh, and about 405 miles from London, which is reached by rail in 9 hours.

History. The origin of the name is unknown. The Romans had a station on the Clyde, near the site of the town, which became the seat of the bishop in the sixth century. In 1450 Bishop Turnbull obtained a charter; and the same prelate founded Glasgow University. In 1638 the Presbyterians asserted in the city the independence of their kirk. Glasgow also seems to have benefited by the invasion of Scotland by Cromwell. Two great fires consumed part of it in 1652 and 1677. It became the head-quarters of the Covenanters, and

was violent in its opposition to the Act of Union. When, however, the advantages of an increased trade began to be felt the city became very loyal in its sentiments, though in 1819, and again in 1848, there were trade-riots.

Trade. Trade-guilds were organised in 1516. Bleaching and calico-printing began here earlier than in Lancashire. The dyeing of Turkey-red had its origin at Glasgow in 1785, and here also bleaching-powder was invented by Charles Tennant in 1798. These, with spinning and weaving, formed until the present century the chief industries of the place. Ship-building on a large scale was begun about 1812, when the steamer *Comet* began to ply between Glasgow and Greenock. The tonnage yearly made amounts to about 300,000. Something like £1,000,000 annually is taken in customs' dues. The iron industry has flourished in Glasgow since the patenting of Neilson's hot blasts in 1828.

Buildings. The cathedral, in the early Gothic style, was begun about 1200, and finished in the middle of the 15th century. Its area is 319 feet by 63. The spire, rising from a central tower, is 225 feet high. The crypt under the choir is distinguished by the splendid ornamentation of its pillars and doors. In 1854 the whole building was repaired and restored under Government supervision. There are numerous well-built modern churches, a handsome Royal Exchange, post-office, and city chambers, all of very recent date. Fine statues are to be seen in George Square and elsewhere, including figures of two Glaswegians, Lord Clyde and Sir John Moore. On the north of the Clyde is Glasgow Green; and there are three public parks in different parts of the city.

Institutions, etc. The University buildings, designed by Sir Gilbert Scott, were opened in 1870. There were upwards of 2,000 students in 1889, divided into four "nations." There are 10 professors of subjects included under arts, and 12 of medicine. Besides the usual degrees, that of Master of Surgery (C.M.) is given, and a certificate entitled Literate in Arts (L.A.) is awarded to students who have attended two sessions. The University joins with Aberdeen in sending a Member to Parliament. A Rector is elected every three years by the students. By the help of the Snell exhibitions some of them are enabled to go to Oxford after finishing their course. The Library dates from the 15th century, and receives an annual grant from the Treasury. Dr. W. Hunter in 1781 left a valuable collection of books, coins, etc., to the University. Among Glasgow men have been John Major, Bishop Burnet, Dr. R. Simson, Smollett, Adam Smith, Thomas Campbell, Lockhart, Sir W. Hamilton, and Archbishop Tait.

The Glasgow and West of Scotland Technical College, founded in 1886, has more than 2,000 students. St. Mungo's College and Anderson's College are for medical students, and there are numerous other educational establishments. The chief charitable institutions are the Royal Infirmary, the Western Infirmary, and the Victoria Infirmary.

There are three fine railway-stations: St. Enoch's, the terminus of the Glasgow and South-Western;

the Central Station of the Caledonian; and the North British Station. There are also underground lines in connection with the North British and Caledonian. Thirty-one miles of tram-lines have been laid down, and transit by water is provided in the river-steamers. The Clyde is crossed by ten bridges, and a tunnel under the river at the harbour is being constructed.

Government of the City. The Provosts or Baillies were at first selected by the Bishops of Glasgow, and when the Church lands were seized by the Crown the right of choosing them was sold to two nobles. In 1636, however, Glasgow became a free royal burgh. From that time till 1833 municipal government was in the hands of the guilds. By the Burgh Reform Act the number of town councillors was fixed at 30, besides the dean of guild and the deacon-convener. The area of the burgh having widened, there are at present 48 members. Glasgow has 7 representatives in Parliament, besides the members for Govan and Partick.

The lighting of the streets is now in the hands of the Corporation. The water-supply is obtained from Loch Katrine, and flows into a reservoir 7 miles from the city and 70 acres in extent. The City Improvement Trust has spent about two million pounds within the last twenty-five years. The valuation of the city of Glasgow was estimated at £3,401,790 in 1889.

Glass may be defined as a hard, brittle, translucent, or transparent substance, consisting chemically of a mixture of silicates of various metals. It may be artificial or natural, many igneous rocks—*e.g.* obsidians—being essentially glasses. The name is, however, usually confined to the artificial product. The derivation of the term seems still a matter of doubt, and the Latin *glacies* (ice), the Gallic *glassum* (amber), and the Anglo-Saxon *glisnian* (to shine), have all been advanced as the source of the present word. The discovery of glass dates back to very ancient times, and was in all probability accidental. The earliest seat of its production was most probably Egypt, where there is reason to believe the process was known about 4,000 years ago. Thus, in some Egyptian tombs at Beni Hassan occur paintings representing glass-blowing, which are referred to a date at least 2,000 years B.C., while some specimens of glass found have been speculatively assigned to dates varying from 1500 B.C. to 2500 B.C. The Chinese also were acquainted with the substance some hundreds of years before the Christian era, but their knowledge was probably derived from the Egyptians. The latter people also understood the art of colouring glass by the admixture of metallic oxides, and the analyses of ancient glasses show that copper, cobalt, and many other oxides used still for the same purpose were the materials they employed. Coloured glass beads and rings (*glain neidyr*) found amid early Druidical remains, have been adduced as evidence that the art was known to the early Britons, but it seems more probable that these were obtained from the traders who visited Britain. This is also supported by their resemblance to other beads, etc., which, as well as

vases, are found around the Mediterranean, and are of Phœnician origin. The latter people it is believed obtained their knowledge of the manufacture directly from the Egyptians. The first mention of glass-making among the Greeks is by Aristophanes, and the industry was not practised to any great extent before the present era. Among the Romans, however, it very speedily spread, and the art was carried to a very high degree of perfection, glass becoming an article of comparatively common usage for domestic as well as decorative and ornamental purposes. Pliny mentioned that they used soda in the manufacture, which is borne out by the analysis of Roman glass, which shows the composition to be not far different from that of our *plate-glass*. They also exported the article, as precisely similar glass is found in Britain and other countries; the glass drinking vessels known to the Welsh, and mentioned by Llywarch Hen and other 6th century poets, being attributable to this or to their manufacture by the Romans in Britain—the Welsh name *gwydr* being derived from the Latin *vitrum*. The Romans were also proficient in the manufacture of coloured glass, and the production of patterns, etc., by melting together differently coloured glasses. For windows, talc was chiefly used, but the remains at Herculaneum prove that glass was also employed for this purpose. No record of glass windows is, however, made before the 3rd century. It is stated that they were first used in England in 674, but they did not come into common use until many centuries later. In the 12th century the knowledge of glass-making seems to have been fairly widely spread throughout Europe. It found its chief seat at Venice, the Venetian glass having the highest reputation, and almost completely monopolising the market. To keep the industry from spreading, many laws were passed by the Venetian Council, prohibiting the emigration of glass-makers, and raising the status of such artificers by bestowing upon them many peculiar privileges and honours. From Venice, however, it spread into France, where it became also established. In the 15th century glass-making was practised in England, and although at first it did not find a firm seat, by the 17th century the English manufactures rivalled those of France and Venice. They were also aided by a liberal bounty, which was repealed by Sir Robert Peel. *Flint glass* was invented by the English makers, and *plate glass* was also first made in England. At the present time the chief seats of the English industry are in Lancashire, near Leeds and Bristol, and along the Tyne.

The silicates present in glass vary in the different varieties of glass, but in all cases one of the metals is either potassium or sodium. If only these are present, however, the substance is readily fusible, and is soluble in water, being known as *soluble glass*. It is frequently employed for coating wood and fabrics to render them fireproof. When mixed with others, these alkaline silicates impart fusibility, the soda glass—soft glass—also being always more readily fused than that containing potash—hard glass. *Crown glass* consists of the silicates of potassium and calcium, which are also the constituents

of the *Bohemian glass*, much used for the manufacture of glass vessels for use in the chemical laboratory. If soda replaces the potash a soda-lime glass results which is used for making *plate-glass* and also for ordinary window glass. The common green glass employed for bottles consists of the same ingredients, but with no pains taken to obtain them perfectly pure, so that bottle glass always contains alumina and iron, to the latter the green colour being due. *Flint glass* or *crystal* consists of the silicates of lead and potassium, while a glass known as *strass*, used largely for making imitation gems, contains the same compounds, but with a higher proportion of lead. Lead glass is easily fusible, and possesses a high specific gravity. Owing to its great refractive power [LIGHT] it is largely used in the manufacture of optical instruments—as prisms, lenses, etc. In glass for optical purposes phosphates or borates are also often added, as they appear to improve the quality of the glass. The proportions of the different constituents vary in different forms of glass, but the following table shows the general tendency.

	Window glass.	Plate glass.	Flint glass.
Silica, SiO_2	69	76.0	59
Soda, Na_2O	13	—	—
Lime, CaO	13	6.0	—
Potash, K_2O	—	17.0	8.5
Alumina, Al_2O_3	5	1.0	—
Oxide of lead, PbO ...	—	—	24.5

The specific gravity of glass varies, in the different species, from 2.4 in Bohemian to about 3.6 in flint glass. Its hardness is usually a little higher than that of steel, so that it cannot be scratched by a knife, but can by a file, and easily by a diamond, the plate, etc., readily breaking along the cut, and this is the method adopted for cutting glass to a required shape. When heated it first softens, and when in this condition it can be drawn out, blown, bent, and worked into every conceivable form and shape. At a higher temperature it fuses and liquefies. If melted and quickly cooled it becomes very hard, but also very brittle, and so unstable that it may completely fly to pieces by the merest scratch, though it might be dropped on to stone or struck with a hammer without fracture. [RUPERT DROPS.] If slowly cooled the reverse effect is obtained, and the glass becomes more stable. Glass vessels, etc., therefore, are, after blowing, cooled slowly and regularly, the process being known as *annealing*. If glass be kept heated for a long time and allowed to cool very slowly, it loses its transparency, becomes crystalline or semi-crystalline, and cannot be easily fused. This change is known as “devitrification,” and appears to be due to the formation and crystallisation in the glass of a number of definite chemical compounds. The more complex the glass, the greater is its liability to this change, which has to be well guarded against during the manufacture. In water, acids, and the liquids in ordinary use, glass

is practically insoluble, and to this it owes much of its value in the laboratory and the manufactures. It is, however, attacked by strong alkalies *e.g.* soda, which combine with the free silica, where it is rapidly attacked by hydrofluoric acid, which acts on silica according to the equation



forming a gaseous fluoride of silicon. This acid is hence used for writing, engraving, and etching on glass. In air it remains unaltered, but in time, owing to the action of water and carbonic acid, it may become so corroded as to display beautiful iridescence, an effect imitated in manufactories by the uses of dilute hydrofluoric acid, or hydrochloric acid under pressure. (For the methods of manufacture of glass and some of the processes of ornamentation, see GLASS-MAKING.)

Glassites, a religious sect formed in Scotland about 1728 by John Glass (1695–1773), a Presbyterian minister, who was deposed in consequence of his *Testimony of the King of Martyrs concerning his Kingdom*, in which he asserted that national religious establishments are contrary to the teaching of the New Testament. The adherents of Glass in England and America became known as Sandemanians, from the name of his son-in-law, Robert Sandeman (1718–71), who held that saving faith, though divinely inspired, is identical in its nature with belief in human testimony. Their number is now probably under 2,000. Faraday belonged to this sect.

Glass-making. The processes employed in the manufacture of glass articles almost all depend upon the property it possesses of becoming plastic and ductile at a temperature a little lower than that at which it fuses; and were it not for this the production of the majority of glass articles in common usage would be an impossible matter. The first essentials for the manufacture are the materials. Of these silica is invariably one. Flint, calcined and powdered, was formerly used in flint glass, but now *sand* is the sole source of the silica. When used for this purpose, the sand should be pure and as completely free as possible from iron, which imparts a green colour to the glass. Before use it is washed and then dried in ovens. The potash and soda are employed in the form of salts of these substances. Formerly, the crude ashes obtained by burning seaweed and known as *kelp* and *barilla* were employed; but as improvements were introduced in the process of manufacture of carbonate of soda (Na_2CO_3) the artificial products replaced the natural. At present, however, sulphate of soda (Na_2SO_4) is generally used instead of the carbonate. The source of the lime is either *chalk* or *limestone*. In the selection of the latter, which yields a harder glass than the chalk, care should be taken to ensure the absence of iron. Lead is usually introduced in the form of *red lead*, Pb_3O_4 , or *litharge*, PbO , the former being the more frequently used. It is obtained for this purpose by heating litharge, prepared from pure lead, in a reverberatory furnace. Broken glass of as nearly as possible the same composition as that being

made is also added to the other ingredients. It is known as *cullet*, and by its use the mass melts at a lower temperature than otherwise. Besides these principal constituents, *cryolite*, *barium carbonate*, and decolorising materials such as *manganese dioxide* are occasionally added. Before melting, the several ingredients are finely powdered, and thoroughly mixed together, this being effected by rotating barrels. The mixture or "*frit*" is then introduced into the "*crucibles*" or "*pots*" for fusion. These crucibles vary in form with the different varieties of glass which it is required to melt in them, but they all require to be made with the utmost care and from the best and most refractory fire-clays, as they have to withstand exceedingly high temperatures (about 2,000° F.), and are exposed continuously to the action of the molten materials inside. In England, Stourbridge clay is usually adopted for their production, which is entirely carried out by hand, the pots being built up of layers, each of which is thoroughly incorporated with the previous by kneading. When built up to the necessary size—about 4ft. 6in. high and 4ft. diameter—they are allowed to set before being removed, the temperature maintained at about 60° F. for many months. They are then baked for from 4 to 6 days in a furnace known as the *pot-arch*, the final heat being equal to that of the glass-melting furnace itself. They are then removed while hot to the furnace where required. The pots generally last from 1 to 4 months. Those used for flint glass are covered, and have an aperture at the side for the insertion of material and removal of the glass; the others are all open. The *furnaces* in which the crucibles are heated require also to be constructed of the most refractory fire-clay and with great care. They are usually circular dome-shaped buildings capable of holding from 5 to 12 crucibles. When heated by coal, the fuel is burned in a grate below the furnace, the flames passing up into the centre and around the pots to flues in the sides. Great care must be taken to keep the fire well and continuously fed and stoked, in order that the temperature of the furnace may not be liable to change. The furnaces are, however, now usually heated by gas, manufactured in separate "*gas producers*" (q.v.), this method being not only more economical and cleanly, but also giving the manufacturer greater control over the temperature. The crucibles are filled in the furnaces by means of long iron shovels through apertures left in the walls for this purpose. The "*charge*" is not added all at once, but from time to time as the materials melt and settle down in the pot. When full of molten glass or "*metal*," the scum is removed from on the top, and the glass is ready for working.

Hollow Ware, such as tumblers, glass jugs, decanters, and countless varieties of other articles, are all blown, and their manufacture necessitates much manipulative skill on the part of the artisan. As a simple case the production of a tumbler may be described. A quantity of the *metal* is collected upon the end or *nose* of a long iron-tube or *blowpipe*, and is rounded by rolling upon an iron slab known as the *marver*. The workman then, by blowing

down the tube, expands the glass into a hollow globe, which is elongated by swinging the blowpipe. The base is then flattened by resting it upon the marver and further blowing. An iron rod known as the *ponty* is attached by a piece of molten glass to the base of the vessel, and then, by touching the hot glass near the blowpipe with a cold iron, it cracks right around its circumference and is detached from the instrument. It is heated again for a short time, and the rim is expanded somewhat to give it the required shape, and is then cut evenly round by an iron shears. By a sharp blow it is detached from the ponty, and placed in the *annealing oven*—a long chamber in which the temperature gradually decreases along its length, the glass vessels, etc., being introduced at the hot end and slowly moved downwards. Bottles, etc., are frequently blown in moulds, as is the case also with many decorative glasses, vases, etc. Frequently also articles are manufactured by direct pressure in moulds of brass or gun-metal. This is employed chiefly for small thick articles, as salt-cellars or jam-dishes. Flint-glass articles are generally after their manufacture subjected to a polishing process known as *cutting*, in which the glass is first ground by revolving wheels supplied with sand or emery and water, and then polished by (1) pumice powder, (2) putty powder or rouge. Glass-tubing for thermometers and scientific purposes is made by blowing out some "*metal*" into a thick globe, when another workman affixes a rod to the end opposite the blowpipe, and the two recede slowly backward until the tube is drawn to the required size. From the tubing afterwards the glass-blower or the optician produces innumerable forms of scientific apparatus. By heating glass rod and drawing it out by a rapidly rotating wheel the glass may be spun to very fine thread.

Crown glass is manufactured by forming a large circular sheet. This is accomplished in the following manner:—The workman, by successive gatherings, collects upon the nose of the blowpipe a quantity of glass, which he then rounds upon the marver into a somewhat conical form. This is expanded by blowing, the apex of the cone, the *bullion point*: being carefully kept exactly opposite the end of the blowpipe. It is thus obtained in the form of a globe, and the front and back of this globe are somewhat flattened. The "*ponty*" tipped with molten glass is then fixed to the "*bullion point*," and the globe detached from the blowpipe by touching with a cold iron. A workman well screened now, holding the ponty, inserts the glass through a large circular aperture into the "*nose furnace*," and rapidly rotates the ponty. Owing to the centrifugal force the mouth of the vessel rapidly expands, and the globe becomes first wine-glass shape, and then spreads into a large circular plate which, still kept rapidly rotating, is removed from the furnace and, after detaching from the ponty, placed in the annealing oven. This method is attended with considerable waste owing to the subsequent cutting into squares and to the presence of the *bull's eye*, where the ponty was affixed. In spite, therefore, of its greater brilliancy, crown is being rapidly replaced by sheet and plate glass.

Sheet glass is manufactured by blowing up a lump of glass, rounded on the marver, into a globe, which is then elongated by swinging and rolled into a cylindrical shape, the end of which is then reheated and blown out. It is next laid on a wooden rest and detached from the blowpipe, and by means of (1) hot glass, (2) cold iron, the end is broken off. The cylinder is next split by running a diamond along its length, internally. It is again heated in the *flattening* furnace and placed on a sheet of glass resting in a large stone bed. It opens out into a wavy sheet which is flattened by means of a block of wood attached to a rod of iron with which the workman rubs it well down into a flat piece. It is then taken to the annealing oven, and thence to the examining-room and warehouse.

Plate glass differs entirely from the preceding in its mode of manufacture, being made not by blowing but by *casting* the glass upon a flat surface. The furnaces employed differ somewhat from those in use for flint and crown glass, as it is necessary to remove the pot itself from the furnace. They are therefore made in the form of long chambers along the sides of which the pots are placed, while doorways large enough for their removal are built along the length. When the glass is in a molten condition the pot is removed by a large fork upon wheels, which fits along a groove in the side of the pot. It is placed upon a truck and immediately run into the casting-room. It is raised by a crane, and, by tilting the pot, the glass is poured over the "casting-table." This consists of a large level metal bed about 30 ft. long and 15 ft. or more broad, constructed of many pieces of iron or phosphor bronze. A cast-iron roller is then rapidly run upon guides back and fore over the length of the table, the thickness of the glass being determined by the height of the guides and its width by their distance apart. The glass plate is then pushed forward into the annealing oven. After annealing the plate is *ground*. This is accomplished by machinery, the plate, lying upon a stone bed, being well rubbed by plates of cast-iron kept supplied with (1) sand, (2) emery and water. After grinding the plate has to be smoothed by a similar machine supplied with fine emery, and smoothed by hand with finest emery-powder—flour emery. The final operation is polishing, usually performed by machine with blocks of wood covered with felt and supplied with water and rouge.

Many devices are employed for ornamentation of glass. It is coloured by the addition of various metallic oxides to the other ingredients; thus, if blue is desired, cobalt or copper (*cuprie*) oxide may be employed. Amethyst is given by manganese dioxide, while oxides of iron or chromium yield a green glass, red being obtainable by the use of *cuprous* oxide, or oxide of gold. The latter gives such an intense ruby coloration that it is only employed as a thin casing over colourless glass.

Frosted glass or crackled glass may be prepared by dipping the glass while hot into cold water, and then again heating and blowing to cause the cracked glass to again cohere. Etching on glass

is performed by coating the glass with wax, then cutting the design through the wax and exposing to the vapours of hydrofluoric acid. Cutting and engraving can also be performed by means of rapidly rotating steel or copper wheels kept covered with sand, or emery and water, or oil.

Painting is effected by means of specially prepared pigments, consisting of a metallic oxide, a flux as borax or sodium carbonate, and fine quartz. They are melted together and so form a coloured glass, which is reground to a fine powder and mixed with a suitable medium—*e.g.* turpentine—used to paint upon the glass. After painting the glass has to be heated, when the pigment fuses and becomes incorporated with the glass itself. (For history of glass-making and chemical composition, *see* GLASS.)

Glass Snake, a limbless snake-lizard, of the genus *Pseudopus*, from Asia and the south of Europe. The name is also given to a similar but larger form (*Ophiosaurus ventralis*), from the southern States of the American Union.

Glastonbury, a small town in the centre of Somersetshire, 25 miles S.W. of Bath. Its traditions go back even farther than those of Canterbury to British times. It was the Avalon of King Arthur, and here, according to William of Malmesbury, Joseph of Arimathæa founded the first British church. Here, in historical times, Ine, King of the West Saxons, built a church, in which, refounded by Dunstan, were buried the Saxon kings, Edmund, Eadgar, and Eadmund Ironside. The abbey was destroyed by fire at the end of Henry II.'s reign, and rebuilt during the next century. The last abbot was hanged on the Tor—a hill 500 feet high, which overlooks the town—in the time of Henry VIII. The Abbot's kitchen (14th century) is still to be seen, and also the chapel of St. Joseph (Transition Norman), standing on the site of the ancient building. Glastonbury has in addition two parish churches, a 15th century inn, and other relics of mediæval times. Sheepskins, rugs, and pottery are made in the town. In a village two miles off Fielding was born.

Glatz, the capital of a district of the same name in Prussian Silesia, 58 miles S.S.W. of Breslau. The town, standing on the left bank of the Neisse, was captured by Frederick the Great in 1742, retaken by the Austrians in 1759, but handed over with the surrounding district to Prussia at the peace. Linen and leather are manufactured here.

Glauber, JOHANN RUDOLF (1638?–68), the discoverer of Glauber's salt, was born at Karlstadt, Franconia. He lived at different times in Vienna, Frankfort, and Cologne, but finally settled at Amsterdam in 1648, in which year he discovered hydrochloric acid. Though an alchemist, cherishing the dream of the philosopher's stone, he rendered many services to chemical science. An English translation of his works was printed in 1689. [GLAUBER'S SALTS.]

Glauber's Salts consists of sulphate of sodium in combination with water, having the formula $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$. It was first discovered by

Glauber in 1658, and, owing to many remarkable medicinal properties being popularly ascribed to it, was then called *sal mirabile glauberi*. He prepared it by the action of sulphuric acid on salt. If exposed to the air, it effloresces, loses water, and becomes converted into the anhydrous salt which also occurs native as Thenardite, and is largely prepared in the manufacture of hydrochloric acid, and as the first product in production of carbonate of soda, the crude sodium sulphate being known as "salt cake." Glauber's salts form colourless monoclinic prisms. It is soluble in its water of crystallisation at 33° C., and reaches its maximum of solubility at about 34° C., after which the solubility decreases. It easily forms "supersaturated" solutions, which, however, immediately crystallise if a small portion of the salt be added.

Glauchau, a town in Saxony, situated on the right bank of the Mulde, 20 miles W. of Chemnitz. Here large quantities of woollen goods are made for export. Among other industries of the place are dyeing, iron-founding, and carpet-making.

Glaucoma. [EYE, DISEASES OF.]

Glauconite, a greenish mineral of variable composition but essentially a hydrous silicate of aluminium, iron, and potassium, which occurs in grains in various sedimentary rocks, especially in the lower part of the Cretaceous system (q.v.), where it gives their names to the Greensands and the Glauconitic (Chloritic) Marl. The grains are sometimes casts of the shells of Foraminifera, and the mineral is now forming similar casts off the coasts of Georgia and Carolina.

Glaucus. (1) Son of Hippolochus, led the Lycians in the Trojan War, and was slain by Ajax. He exchanged arms with Dionædes. (2) A Bœotian fisherman, having eaten of a herb sown by Kronos, became a sea-god. He annually visited the Greek coasts, and delivered oracles to fishermen and sailors.

Glebæ ascripti, the name given by Roman jurists to tenants who were bound to the land they cultivated, but remained undisturbed as long as they paid a fixed rent in kind or services.

Glebe Land, the portion of land which appertains to a parish church. If there be both a rector and a vicar, the glebe land in the occupation of either does not pay tithes, though if in the occupation of a tenant it does. The representatives of a deceased incumbent are entitled to the corn sown by him on the glebe. Various statutes have from time to time been passed in order to facilitate the exchange of glebe lands, which are often scattered in small parcels in different parts of the parish. In rectories the chancel and the churchyard also are the freehold of the rector, while in vicarages the churchyard is the vicar's freehold, and the chancel is the freehold of the impropriator. Yet the disposal of the pews and seats in the church appertains by law to the ordinary and practically to the churchwardens, to whom the authority of the ordinary in this respect is delegated. Moreover, no monument can be set up without the ordinary's consent, and an aisle or side chapel in the church,

or a pew in its nave, may be granted by faculty of the ordinary to an individual and his heirs as appurtenant to a particular house in the parish. By a statute passed in the 5th and 6th years of the present reign the Tithe Commutation Commissioner may ascertain and define the boundaries of the glebe lands of any benefice, or, with consent of the ordinary and patron, may exchange the glebe lands for other lands within the same or any adjoining parish or otherwise conveniently situated.

Glee, a form of musical composition confined to England, for three or more solo voices, usually unaccompanied, and in two or three different measures. Unlike the madrigal, it is not strictly contrapuntal, but is written for single voices to each part—a characteristic which distinguishes it from the modern part song. The greatest glee composers were Webbe (1740–1816), Stevens (1757–1837), and John Wall Calcott (1766–1821).

Gleig, GEORGE ROBERT (1796–1888), the biographer of Wellington, was born at Stirling, his father being the Bishop of Brechin. He served as officer in the army in the Peninsula and America, but took orders in 1820. For nearly thirty years he was Chaplain-General and Inspector of Military Schools. *The Subaltern* (a novel) described his experiences of war. Lives of Warren Hastings and Clive had preceded the publication of that of Wellington (1862).

Gleim, JOHANN LUDWIG (1719–1803), a mediocre German poet, but liberal patron of men of letters, was affectionately called "Father Gleim." He wrote seven volumes of verses, imitations of classic lyrists, songs and fables; but his "*Lieder eines Preussischen Grenadiers*" ("Songs of a Prussian Grenadier") was his only work of any merit. He died at Halberstadt, in the neighbourhood of which he had been born.

Glencoe, a valley in Argyleshire, Scotland, extending 10 miles easterly from Ballachulish on Loch Leven. The mountains on both sides of the glen rise almost perpendicular, and are grotesque in form; and through the vale flows the Coe. The stream is celebrated as the "Cona" of Ossian; and the valley, as the scene of the massacre of the Macdonalds, has been vividly described by Macaulay (*History of England*, ch. xix.). In 1884 a monument was set up to mark the scene of the occurrence.

Glendower, OWEN (OWAIN GLYNDWR), Welsh chieftain, was born about 1359, and died about 1416. He claimed descent from the princes of North Wales, where he had large estates. He studied English law at Westminster, and served in the Scottish campaign of Richard II. Early in the reign of Henry IV. he assumed the title of Prince of Wales, and headed a national rising against the English. Owen soon had to go into hiding, and was excepted from the pardon issued by Henry in 1400; but next year he appeared in South Wales, and also attacked Carnarvon. In 1402 he defeated and captured Sir Edmund Mortimer, who soon after married his daughter and became his ally. By the end of 1403 all Wales had risen against Henry IV., and Glendower had the Percies

as allies. Next year he concluded a treaty as "Prince of Wales" with Charles VI. of France, and summoned a Welsh Parliament. He was, however, soon after defeated by Prince Henry, and one of his sons was taken prisoner. A French force landed at Pembroke in the same summer, but effected little; and Glendower during the next few years suffered many losses, and was generally on the defensive. His last days are obscure. Though Henry V. was willing to pardon him, he refused to treat, and is believed to have died of starvation. Accounts of him are to be read in Tyler's *History of Henry V.*, Wylie's *History of Henry IV.*, and Pauli's *Geschichte von England*. Shakespeare portrays him as a man of great musical talent, but a great braggart (*King Henry IV.*, Part 1).

Glenelg, CHARLES GRANT, BARON (1778-1866), an English statesman, was born in India. Having entered Parliament as a Canningite Tory, he became Chief Secretary for Ireland (1819-22), Vice-President of the Board of Trade (1823-27), and President (1828). He afterwards joined the Whigs, and held the offices of President of the Board of Control (1830-34), and Colonial Secretary (1834-39). He was made a peer in 1835, and retired from political life after his resignation, which followed his approval of the Canadian ordinance of Lord Durham (q.v.).

Glioma, the name given to a form of tumour which occasionally develops in nervous tissue, and particularly in the retina. A glioma consists of delicate cells with a variable amount of interstitial tissue. The growth usually extends rapidly, infiltrating the surrounding tissues. From the situations in which they appear these tumours are apt to give rise to serious symptoms.

Globe Fish, any species of the group Tetrodonta, of the Plectognathous family Gymnodontes, from tropical and sub-tropical seas. The short thick body is scaleless, but more or less covered with spines which become erect when these fish distend themselves with air into the globular form which gives them their popular name. Then they float back downwards, and are driven about by the wind, though we have Darwin's evidence that at least one species can use the pectoral fins for guiding its course. There are several genera, the best known being *Tetrodon* and *Diodon*. In both the jaws form a beak, with strong dental plates for breaking-down coral and crushing molluscs, on which they feed. In *Tetrodon* these plates are divided above and below, in *Diodon* they are entire. The flesh is unfit for food, and that of some species is poisonous, but its noxious qualities vary in different individuals and at different seasons.

Globes are spheres of pasteboard, india-rubber, or other material, faced with paper on which may be depicted the arrangements of land and water of the earth, or the configuration of the stars. There are thus *terrestrial* and *celestial* globes, the former of which having the advantage of exhibiting the true relative positions of the objects they mark out as seen from the earth. Terrestrial globes are mounted on pivots at the extremities of

the polar axis, to exhibit the diurnal rotation of the earth.

Globigerinidæ, a family of Foraminifera (q.v.) of which *Globigerina* is the type genus. This is of interest as it is one of the leading constituents in the deep-sea deposits known as "Globigerina ooze," and is one of the commonest fossils in the Chalk.

Globulin. The "Globulins" form together a division of those nitrogenous substances known as albuminoids. They are distinguished from other groups of these substances by being (1) insoluble in water, but (2) soluble in dilute acids, alkalies, and solutions of salts. The chief members of the division are *Myosin*, contained in muscle; *Fibrinogen*, in the blood; *Vitellin*, in yellow of egg; and *Hæmaglobulin*, in the blood. The latter is frequently called *serum globulin*, or simply *globulin*. It may be obtained by passing a stream of carbonic acid through the serum of the blood. It is then obtained as a white, granular powder, possessing the properties mentioned above, and coagulates if its solution be warmed to 70° C.

Glogau, or GROSS-GLOGAU, a fortified town in Prussian Silesia, 55 miles N.W. of Breslau. Standing on the left bank of the Oder, on a branch railway from Frankfort to Breslau, it is an important centre of the wool trade. It has stood many sieges from the 11th century onwards, and was captured by Frederick the Great in 1741 from Austria.

Glommen, the chief river of Norway, flows from Lake Oersund in the Dovrefield plateau, in a southerly direction, through Hedemarken and Christiania into the Skager Rack, and has a course of about 350 miles. The stream is very rapid, and often overflows its banks. Frequent falls prevent navigation, except for a few miles near the mouth. At Sarpsfos the fall is 75 feet, and is a magnificent sight.

Gloss originally denoted an obsolete or an unusual word in an author's text, or a word in a foreign text requiring explanation, but was afterwards applied to the explanation itself. Collections of glosses on the early Greek poets abounded during the Alexandrian period. The Rabbinical writers expended the same care on the text of the Hebrew Scriptures, and there were numerous glossarians of the Latin Vulgate. Glosses of a different kind, interpreting the matter rather than the words, were inserted by the jurists in the MSS. of Roman and canon law, either on the margin or between the lines. The explanations of Latin, Greek, or Hebrew words by their Teutonic, Keltic, or Romance equivalents or *vice versâ* in mediæval MSS., sometimes furnish a valuable clue in etymological researches.

Glossop, a town in Derbyshire, 19 miles W.N.W. of Sheffield. The place, which was incorporated in 1866, is a centre of the cotton trade, and has also iron-foundries, woollen and paper mills, and other industrial establishments.

Glossophora, the subclass of Mollusca (q.v.) which includes those with a distinct head and a radula (or toothed tongue).

Gloucester. 1. An English town, on the left bank of the Severn, 38 miles N.N.E. of Bristol. It was made a Roman station (Glevum) by Claudius, and was the seat of several religious houses, of which the last, a Benedictine Abbey, was suppressed in 1530. Two years later the See of Gloucester was founded. It was held by Hooper and Warburton among others, and was joined with that of Bristol in 1836. The cathedral was begun in the 11th century, and finished in 1498. It is chiefly Perpendicular, but the crypt and the interior of the nave are Norman. The east window is the largest in England, and the building contains the canopied shrine of Edward II., a statue of Jenner, and a group by Flaxman. Its fan-vaulted cloisters and fine stained glass are also among its glories. The cathedral was restored by Sir Gilbert Scott. Here, alternately with Hereford and Worcester, is held the festival of the Three Choirs. Other notable buildings in Gloucester are the Deanery, the New Inn (15th century), the Tolsey (guildhall), and the King's School. It was in mediæval times one of the chief places in the west of England, and the repulse of Charles I. before it was one of the most important events of the Great Rebellion. It was once the seat of a thriving cloth manufacture, but is now chiefly a commercial town. The trade of its port has largely grown in recent years. Corn and timber are imported, and agricultural and mineral produce form the exports. Several Parliaments have been held at Gloucester, which now has one member. Taylor, the water-poet, Whitefield, and Raikes, were natives of the city.

2. A port of Massachusetts, United States of America, 28 miles N.N.E. of Boston, was incorporated in 1642. It has a good harbour and extensive fisheries. Ship-building and granite quarrying also employ the inhabitants.

Gloucestershire, a county in the west of England, bounded on the north by Worcestershire and Warwickshire, on the south by Somerset and Wilts, on the east by Oxfordshire, and on the west by Monmouthshire and Herefordshire. It has an area of 1,258 square miles. The Cotswold Hills in the north and centre of the county are the source of the Thames. Their highest point is over 1,000 feet. Between them and the Severn extend the Vales of Gloucester and Berkeley; and west of the Severn is the Forest of Dean. There is much good pasture, and cheese and cider are largely made. In the Forest of Dean and near Bristol are large coal-fields, and building-stone is quarried. The Wye flows between the county and those of Monmouth and Hereford. The chief towns are Gloucester, Bristol, Cheltenham, and Stroud. Gloucestershire returns five members to Parliament.

Glover's Tower, a tower built of lead, lined with firebricks, which is employed in sulphuric acid manufacture for the purpose of utilising the nitrous fumes absorbed by sulphuric acid in another stage of the process. The acid is allowed to flow down over flints in the tower, mixed with a weak acid, when the fumes are evolved, and pass off with the sulphurous acid which is passing up the towers to

the chambers to again assist in the production of the acid.

Gloves. The use of gloves as a protection to the hands dates from a very early period. We are told in the *Odyssey* that Laertes wore them when working among the thorns. Xenophon ridicules the Persians because they used them in cold weather, and up to a late period they were regarded as an effeminate luxury by the austere Romans. Passing to the Middle Ages, mention is made in the life of St. Columban, written in the 7th century, of their use in manual labour. In the 12th century they became an article of ecclesiastical apparel, and two centuries later they were much worn by the upper classes in England. The London gild of glovers received a charter in 1464. In Eastern countries the gift of a glove was from a remote period the symbol of a transfer of property, and this is probably the meaning of Ruth iv. 7 and Psalm cviii. 9, "shoe" being a mistranslation. In mediæval times the casting of a glove on the ground was a challenge to single combat. Another symbolic use survives in the white gloves presented to a judge at the assizes when there are no cases for trial. Gloves are now made of many materials, including wool, silk, cotton, and leather. Leather gloves are generally known as "kid," and real kid skins are used for the finer kinds, but the greater number are made of lambskin. Sheep-skin is the ordinary material for dogskin, buckskin, and doe-skin gloves, and calfskin is used for some of the thicker varieties. In some cases the skins are prepared by the ordinary method of tanning or shamoying, but those for "dress gloves" are subject to a special process called "tawing." This consists in applying a mixture of flour, yolk of eggs, and alum to the skins after they have been piled under the influence of heat, an operation which renders them very soft and flexible. When prepared, the skin is cut into separate pieces. These are folded, and an oblong slice is made in the fold at the point where the thumb-piece is to be attached. The fingers are produced by making three incisions in the doubled skin, and sewing them together with gussets on each side of the second and third fingers, and the inner side of the first and fourth. Diamond-shaped pieces are also added at the lower extremity of each finger. Sewing-machines are to some extent used, but most of the sewing is done by hand. The regularity of the stitches is sometimes secured by enclosing the pieces which have to be sewn together in a sort of vice with a serrated edge. The chief seat of the English glove industry is Worcester, where dog-skin gloves are manufactured from the tanned skins of Cape sheep. The English glove-makers are, however, far surpassed by the French, who manufacture large quantities at Paris and Grenoble. Many cheap and serviceable gloves are made at Copenhagen and Brussels. The manufacture of woven and knitted gloves is a perfectly distinct industry, mainly carried on in Saxony and at Berlin.

Glow Discharge, in *Electricity*, means the dissipation of a charge of electricity of high

potential by convection. Particles of air are charged by contact, and are then repelled. Faint sparking is produced at each small transfer and a glow is visible around the surface of discharge. The convection is more vigorous where the surface has greatest curvature, and there the glow is more intense. [BRUSH DISCHARGE.]

Glowworms, a family of beetles known as the *Lampyrinae*. Their popular name is derived from the fact that the female, a wingless, grub-like insect which lives on grass, emits a bright green light from a spot on the abdomen. They are common and widely distributed all through England and Central Europe, and their luminous spot makes them very conspicuous. The male of the common English species is less generally known; it is a light-brown insect about half an inch in length, and is only very slightly luminous. The use of the light to the insect has been much discussed, but it is probably a secondary sexual character, serving to guide the male to the female; it may also serve in part as a protection against birds. The origin of the light in the glowworms, fireflies, click beetles, etc., is discussed under PHOSPHORESCENCE (q.v.).

Gloxinia, a genus of *Gesneraceae*, a gamopetalous order, natives of tropical America, many of which are cultivated for the sake of their showy flowers. They have opposite, stalked leaves, which are often velvety and rather fleshy, and may be used to propagate the plant, as in *Begonia*. The flowers are either drooping or erect, the corolla bell-shaped and the modern hybrid forms almost polysymmetrically so. They vary much in colour.

Glucinum. [BERYLLIUM.]

Gluck, CHRISTOPH WILLIBALD, RITTER VON (1714-1787), the great German musical composer, was born at Weidenwang, in the Upper Palatinate, probably in 1714. He was brought up in the castle of Prince Lobkowitz at Eisenberg, in whose service his father was forester and his mother a cook. He was educated at a school in Bohemia and at Prague University, and while a student gave lessons in music. He was introduced by Lobkowitz to Prince Melzi at Vienna, and that amateur sent him to study under Sammartini at Milan. His early works, of which the opera *Artaserse* (1741) was the first, were popular, but had all the faults of the Italian school. His fame, however, was such that he was invited to London in 1745, where he produced three operas, and gave a performance with musical glasses. Handel had a poor opinion of his operas, and after a period of study Gluck began to change his conception of operatic music. The chief works of his second or transition period were *Telemacco* (1750) and *La Clemenza di Tito* (1751), produced at Rome and Naples respectively. From 1755 onwards for several years he lived at Vienna, where seven years later his masterpiece, *Orfeo ed Euridice*, was given, the libretto being by Calzabigi. He was obliged, however, to compose a good deal for his noble patrons and to suit their taste. Nevertheless, in 1767 and 1769 he was able to produce his second and third great works, *Alceste* and

Paride ed Elena. The artistic revolution was carried out in Paris, where in 1774 the *Iphigenia in Aulis* was produced. The old school did not, however, submit, and a contest of several years was necessary to ensure the acceptance of the new theories. Gluck was backed by the influence of the Dauphiness, afterwards Queen Marie Antoinette, who had been his pupil at Vienna; but the literary band who supported Piccini, his Italian rival, included D'Alembert, Marmontel, and La Harpe. Each of the rivals composed an opera on the subject of *Iphigenia in Tauris*, but the success of Gluck's work was so great that Piccini delayed the publication of his own opera for two years. In 1780 Gluck returned to Vienna, having amassed a fairly large fortune. He died of apoplexy seven years later, at the age of seventy-three. He composed but little of importance that was not operatic, but in that department he was the first great master, the forerunner of Mozart, Weber, and Wagner. There are three German lives, and one in French, of this great composer, whom Burney called the Michel Angelo of music.

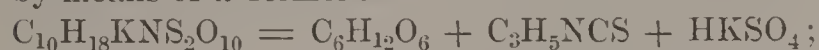
Gluconic Acid is a monobasic acid of formula $C_6H_{12}O_7$, which is obtained by the oxidation of various carbohydrates as starch, grape sugar, maltose, etc. It forms a syrup, and cannot be obtained crystalline; many of its salts, however, such as those of calcium and barium, crystallise well. The ordinary form of the acid is dextrorotatory [POLARISATION], but a levorotatory as well as an inactive modification is also known.

Glucose. [DEXTROSE.]

Glucoses are a class of the carbohydrates of which ordinary grape sugar or dextrose may be regarded as typical. They resemble one another very closely in their properties and reactions, and have the formula $C_6H_{12}O_6$. Their constitution appears to be always that of an aldehyde or a ketone, containing the groups $CH \cdot CHO$, or $CO \cdot CH_2$ OH. The number of glucoses has been considerably extended within recent years, many varieties having been synthetically prepared. The term is also frequently extended to other carbohydrates, which in constitution resemble these glucoses, but contain fewer or greater carbon atoms in the molecule as the pentoses $C_5H_{10}O_5$, the heptoses $C_7H_{14}O_7$, the octoses $C_8H_{16}O_8$, the nonoses $C_9H_{18}O_9$; those glucoses with six carbon atoms being designated hexoses.

Glucosides are a class of bodies which are obtained from plants in all cases, and have not at present been prepared synthetically. They may all undergo decomposition into two or more substances, one of which is always a sugar, usually glucose (hence name). The change may be induced by boiling with water alone under pressure, or, and more easily, by heating with dilute acid or by fermentation. They are usually obtained from the vegetable product in which they occur, by digesting with alcohol. Very many are known, but those of most interest from their products, etc., are *Æsculin* (q.v.), $C_{15}H_{16}O_9$, which yields glucose ($C_6H_{12}O_6$) and æsculetin; *Amygdalin* ($C_{20}H_{27}NO_{11}$), which yields

glucose, "bitter almond oil" (q.v.), and hydrocyanic acid; *Arbutin* ($C_{12}H_{16}O_7$), yielding glucose and hydroquinone ($C_6H_6O_2$); *Salicin* (q.v.), $C_{13}H_{18}O_7$, yields glucose and saligenin ($C_7H_8O_2$); *Myronic Acid* ($C_{10}H_{19}NS_2O_{10}$), the potassium salt of which yields glucose, allyl mustard oil, and hydrogen potassium sulphate, the decomposition being effected by means of a ferment—



Ruberythric Acid, $C_{26}H_{28}O_{14}$, occurring in madder, etc., which by the action of hydrolysis yields glucose and alizarin (q.v.).

Glue consists of an impure form of gelatine (q.v.), and possesses generally the properties of that substance. It is manufactured chiefly from bones, which are ground coarsely and then digested with a dilute acid until soft, being afterwards freed from acid by thoroughly washing with water. They are then placed in large iron vessels known as digesters, in which they are subjected for some hours to the action of steam of from 2 to 3 atmospheres pressure—the resulting liquor, consisting of water, glue, fatty materials, etc., being then run off by pipes into tanks, from which the fat is skimmed and used for manufacture of soaps and greases. The liquor which remains is filtered through wire gauze, concentrated by boiling, and run into moulds to set, after which the cakes are dried at about 60° to 70° Fahr., and are then ready for storing for the market. If required to be of the best quality, the glue is bleached before concentrating, when it is obtained of a pale yellow colour. The bones left in the digesters are usually allowed to dry, and utilised for bone manures. The different varieties of liquid glues generally consist of gelatine, either pure or not, dissolved in acetic or some other acid, the solution forming a strong cement, which may be used for pottery, glass, etc.

Glume, a rigid or chaff-like bract in the inflorescence of grasses and sedges, whence the two orders *Graminaceæ* and *Cyperaceæ* are united into one series under the name *Glumifloræ*. These glumes were at one time thought to represent perianth-leaves. They are often green at first, and are sometimes furnished with a terminal or with a dorsal awn (q.v.). The innermost glume, or *pale*, is commonly colourless and transparent, with two longitudinal green veins, so that it probably represents the union of two such organs.

Glutamin, a compound of composition $C_5H_{10}N_2O_3$, resembling "asparagine," and which occurs with this substance in beet-root.

Glutaric Acid, a dibasic acid, the formula being represented by $COOH \cdot CH_2 \cdot CH_2 \cdot CH_2 \cdot CO \cdot OH$. It crystallises in large soluble monoclinic plates, melts at 97°, and boils at 313°. Its synthetic preparation proves its constitution, and it is of much theoretical interest, owing to the ready manner in which it may be converted into "pyridine" derivatives, and to the synthesis of the vegetable alkaloid piperidine by its use.

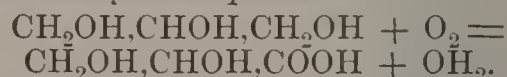
Gluten. If flour be kneaded under water, the starch is washed out, and a sticky mass remains—

the gluten. When partially dried but still possessing some moisture, it is a tough, translucent, elastic, and tenacious mass, but if thoroughly dried it becomes brittle, and cannot again be made plastic by the addition of water. It is of great importance in bread-making, and owing to its adhesive nature, when yeast is added and carbonic acid gas formed, the bread expands and becomes porous. It is insoluble in water. It contains about 80 per cent. of a *fibrin*, and about 20 per cent. of *glutin*, probably another albuminoid, the formula for which is not yet established. Ordinary flour contains as a rule about 12 per cent. of gluten.

Glutin. [GLUTEN.]

Glutton (*Gulo luscus*), the largest of the weasel family, and the sole species of its genus. It is a native of the northern parts of both hemispheres, and the American form is generally called the Wolverine. The body is thick-set, with short limbs, and a broad, rounded head; the total length is a little over three feet, of which something less than a quarter goes for the tail. The chestnut-brown under-fur varies much in quality, but when fine and glossy is highly valued; the longer hair is dark-brown or black with a pale reddish-brown band on each side. There is no anal pouch, but the animal emits a musky-smelling liquid when attacked. Gluttons are flesh-feeders, preying on smaller mammals, especially on fox-cubs, but they do not disdain to steal the bait from hunter's traps. These animals are not more gluttonous than other carnivores, and the tales told of their ferocity have no foundation in fact.

Glyceric Acid, a monobasic acid of composition $C_3H_6O_4$, which is obtained by the oxidation of glycerine by means of nitric acid, one of the alcohol groups being oxidised to the acid group, as represented by the equation



It may be obtained also by many other reactions. It forms a soluble, syrupy, uncrystallisable liquid. As ordinarily prepared it is an inactive substance, but from it two very similar acids may be obtained, the one dextro- and the other lævo-rotatory. [POLARISATION.] If heated to 150° it decomposes, and on fusion with potash gives acetic and formic acid.

Glycerine, or GLYCEROL, when pure, is a thick, white, viscid liquid, possessing a very sweet taste, hence its name. It is heavier than water. (specific gravity 1.265), but readily mixes with it. It soon absorbs moisture from the atmosphere, and in damp air may increase in weight greatly, absorbing half its mass of water. It is a very good solvent for organic and many inorganic substances. If cooled it may be obtained as a crystalline mass which melts at 17° C. Its composition is represented by the formula $C_3H_8O_3$, and its properties and reactions prove it to be of the nature of a trihydric alcohol possessing two primary and one secondary alcohol groups [ALCOHOL], and represented by the formula $CH_2OH \cdot CHOH \cdot CH_2OH$. If oxidised it yields a number of products, as glycerose ($CH_2OH \cdot CO \cdot CH_2OH$), which resembles

in many respects the sugars: *glyceric acid* (q.v.); tartronic acid, $\text{CHOH}(\text{COOH})_2$, while if the oxidation is more energetic it decomposes into oxalic and other acids. It boils at 290° , but decomposes slightly, giving off a pungent odour owing to the formation of *acrolein*. It may, however, be distilled unaltered under diminished pressure, a fact made use of in its purification. It is present in fats and oils combined with various fatty acids, as stearic, palmitic, etc. From these it is always manufactured, and its production is largely carried on in conjunction with those of candles and soap. In the candle (q.v.) manufacture the fats, etc., are decomposed by blowing in superheated steam. Two liquids are obtained, the one consisting of the fatty acids and the other of a solution of glycerine. These are separated, and the dilute glycerine is purified by distillation under diminished pressure in suitable forms of apparatus. Sulphuric acid is sometimes employed to effect the decomposition of the fats, in which case the glycerine is obtained in combination with the acid and has to be liberated by addition of lime. It is also very largely obtained from a bye product—the *spent lye*—of soap-works. [SOAP.] This contains water, glycerine, and various salts of soda and potash, with a number of various impurities of a resinous and albuminous nature. From this it is obtained by (1) heating with lime and resin, the scum formed being removed by skimming; (2) blowing through hydrochloric acid with the addition of some bleaching-powder to remove sulphur. A liquor is so obtained, containing chiefly a solution of salt and glycerine. This is concentrated when the salt is precipitated, and the crude glycerine is purified by distillation. Very large quantities of glycerine are employed in the production of *nitro-glycerine* (q.v.), the basis of dynamite and many other powerful explosives. Mixed with lead oxide it forms what is known as “lead plaster.” It is used frequently in medicine as a solvent and for local application. It is also used largely in the chemical laboratory, as a preservative, and also in many manufactures, as in calico-printing, copying-ink, etc.

Glycerol. [GLYCERINE.]

Glycine, or GLYCOCOL, is a substance of composition. $\text{CH}_2(\text{NH}_2)\text{COOH}$, *i.e.* amido-acetic acid. It possesses acid properties owing to the presence of the acid group COOH , but the amido group, NH_2 , bestows upon it basic properties also, so that it can be combined with either base or acid. It forms large crystals belonging to the rhombic system, is soluble in water, and possesses a sweet taste. It may be readily prepared from acetic acid, and by many reactions, and is a product of the decomposition of many animal substances. It is present in the bile combined with another acid, glycholic acid, to form glyco-cholic acid, and is formed also in combination with benzoic acid in the urine of horses (hippuric acid). It is also closely related to the substance Lencine which occurs in many of the juices of the animal body.

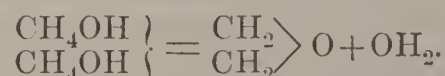
Glycocol. [GLYCINE.]

Glycogen is a white powder closely resembling starch, which occurs in the liver of many animals. It possesses the formula $\text{C}_6\text{H}_{10}\text{O}_5$, belonging to the group of bodies known as carbohydrates. It may be distinguished from starch by its giving a brown colour, instead of a blue, with iodine. If heated with a dilute acid it combines with water, forming dextrose, $\text{C}_6\text{H}_{10}\text{O}_5 + \text{OH}_2 = \text{C}_6\text{H}_{12}\text{O}_6$, while by the action of ferments maltose is also obtained.

Glycol is the first of the series of “glycols” or dihydric alcohols. Glycol has the formula $\text{C}_2\text{H}_6\text{O}_2$ or $(\text{CH}_2\text{OH})_2$. It is a thick colourless liquid of specific gravity 1.125, which dissolves in water in all proportions. It possesses a sweet taste, hence its name (Gr. *glykys*, sweet). If oxidised it yields first an acid of composition $\text{CH}_2\text{OH}\cdot\text{COOH}$, glycollic acid, but on further oxidation the second alcohol group is also attacked, while intermediate aldehyde products, as glycoxal, $\text{CHO}\cdot\text{CHO}$, and glycoxilic acid, $\text{CHO}\cdot\text{COOH}$, are also produced.

Glycollic Acid. [GLYCOL.]

Glycols are a series of compounds which may be represented by the general formula $\text{C}_n\text{H}_{2n+2}\text{O}_2$, and may be regarded as derived from the paraffins by the replacement of two hydrogen atoms by two hydroxyl (OH) groups. They hence contain two alcohol groups, and are to be regarded as dihydric alcohols. According to the nature of the groups they may form *diprimary*, *primary-secondary*, etc., alcohols (q.v.). They are all thick viscid liquids with a sweet taste, soluble in water, and exhibit a gradation in properties as the number of carbons increase. They form salts or glycollates with sodium, etc., and form ethers (q.v.) with acid radicals. They also readily form oxide owing to the elimination of water. Thus—



Glycosuria, a name given to the disease in which sugar (glucose) occurs in the urine.

Glyoxal. [GLYCOL.]

Glyptodon, a genus of gigantic fossil armadillos, found in the Pleistocene fluviatile deposits of the Argentine Republic. The head, trunk, and tail are covered with bony plates, almost hexagonal and united by sutures; but there are no bands in the armour, so that the animals could not roll up like recent armadillos. The vertebræ are almost all fused together into one bony cylinder, and the feet are massive. These animals, in some cases, reached over 9 feet in length. With four related genera, *Glyptodon* forms a distinct family of Edentata (q.v.), the *Hoplophoridae*.

Gmelin, LEOPOLD (1788–1853), a German chemist, was born at Göttingen. He came of a scientific stock, as his great-uncle, JOHANN GEORG (1709–55), was a great traveller and one of the chief botanists of his day, and his father, JOHANN FRIEDRICH (1748–1804), was Professor of Medicine at Tübingen and Göttingen, and left a *History of Chemistry* and other works. Leopold held the chair of Chemistry and Medicine at Heidelberg for many years, and was author of a *Handbuch der*

Chemie (translated by Watts) and several medical works.

Gmelin's Test for bile pigment. The presence of bile pigment in natural or morbid fluids is demonstrated by the peculiar play of colours which is produced on the addition to the fluid of a few drops of nitric acid yellow from the presence of nitrous acid.

Gneisenau, AUGUST WILHELM ANTON, GRAF VON (1760-1831), an able Prussian general, was born at Schildau, in Saxony. He first took service in the Ansbach army, and went to America during the War of Independence as a mercenary in the British service. In 1786 he had a personal interview with Frederick the Great, who gave him a commission in the Prussian army. He was present at Jena, and distinguished himself as chief of the garrison at the siege of Colberg (April-July, 1807). During the dark days of Prussia he busied himself with schemes for reorganising her army, and in 1809 Napoleon compelled him to resign. While in retirement he continued his plans, and called upon Europe for help. During the War of Liberation he was quartermaster-general to Blücher, and in the Waterloo campaign was his second-in-command. He was named Field-Marshal in 1825, but his Liberal opinions kept him in the background. He was a great force in his own province of Silesia, where he died of cholera. There are lives of him by Pertz and Delbrück.

Gneiss, a foliated rock, composed essentially of orthoclase felspar, quartz, and mica. Bubble-cavities containing water and liquid carbon dioxide occur in the quartz; plagioclase felspars and garnet are common accessory minerals, and hornblende, talc, and graphite are sometimes so abundantly present, replacing in part the mica, as to give names to recognised hornblendic, talcose, and graphitic varieties. Lithologically gneiss hardly differs from granite (q.v.), except in its foliation (q.v.), and some of the coarser varieties do not exhibit this structure in hand-specimens. Gneiss is said to graduate in the field either into mica schist, slates, or less altered sedimentary rocks; or, on the other, into true granite. It has been generally considered a highly metamorphosed aqueous rock; but may, at least in some cases, be a granite molecularly rearranged. Most gneiss is associated with Archæan rocks (q.v.).

Gneist, HEINRICH RUDOLF (b. 1816), German jurist and historian, was born at Berlin. Till 1850 he held judicial posts, but after that time devoted himself chiefly to writing and teaching. In 1844 he became Professor of Jurisprudence at Berlin, and in 1858 a member of the Prussian Diet. He was afterwards also elected to the Reichstag. His chief works are *The Constitution of Trial by Jury in Germany*, *The Administrative Law in England*, and *History of the English Parliament*. He was political instructor of the Emperor William II., and in 1875 became Senior Judge of the Supreme Court of Prussia and a Privy Councillor.

Gnome, an imaginary being supposed to inhabit the interior of the earth, and to be the guardian of

animals, vegetables, and especially of minerals and mines.

Gnomon, in *Geometry*. If a parallelogram is divided into four parts by two lines parallel to its sides intersecting at a point on either diagonal, and if one of these four parts be removed which is cut by this diagonal, the remaining three constitute a gnomon. The term is also used to denote the rod of a sundial that is placed parallel to the axis of the earth, and whose shadow marks the time on the dial.

Gnosticism, a system of belief which attempted to combine Christian doctrines with elements derived from Greek philosophy, Judaism, and Oriental religions. The Gnostics were so called because they laid claim to knowledge (Greek *gnosis*) of a special kind concerning the mysteries of the Divine nature. Gnosticism reached its most vigorous state about the middle of the 2nd century, and died out in the latter part of the 4th century. Its main principles were everywhere the same, but the doctrines based upon them differed considerably in the various sects. The following were the cardinal points of the system:—There is one Eternal and Supreme Deity, who dwells apart from the *hyle* or material world in the midst of a *pleroma* or fulness of light. From Him there emanate numerous Æons, representing for the most part certain attributes of Deity, such as Wisdom, Truth, and Might. The Æons partake in a varying degree of the Divine nature, and low down in the scale is the Demiurgus, the creator of the visible world, who was identified with Jehovah, the God of the Old Testament. Those Gnostics who were influenced by Zoroastrian doctrines held that the Demiurgus is the evil principle in the universe, and that he is engaged in a perpetual conflict with the Supreme Deity, the source of all good. All the schools recognised a three-fold division of mankind—the “spiritual,” who have an insight into the Divine nature; the “terrestrial,” who are under the dominion of matter; and a third class, who are subject to the laws imposed by the Demiurgus for the attainment of his own ends. As matter is essentially evil, there is no resurrection of the body. For the same reason the doctrine of the Incarnation, which involved the combination of the divine nature with a material body, was rejected, and either the divine or the human attributes of Christ were explained away. The Ebionites, Basilidians, Carpocratians, and Cerinthians held that He was a man, and that the Divinity descended upon Him at His baptism in the form of a dove, leaving Him before the crucifixion. The Saturninians, Encratites (followers of Tatian), and Marcionites, on the other hand, maintained that the body of Christ was an unsubstantial phantom; while the Bardesarians and Valentinians asserted that it was composed of the same elements as those of the angels. The redemption was represented as a communication to mankind of the *gnosis*, which delivered the spiritually-minded from the bondage of the material world. These general principles gave rise to two widely different views of conduct. Some endeavoured by a severely ascetic life to maintain a rigid self-control, which would deliver them from the influence of the

hyle or the Demiurge, while others held that for those endowed with *gnosis* all actions were indifferent, and expressed their contempt for matter by giving free vent to their animal appetites. In so far as they accepted the Old Testament, the Gnostics interpreted it in a symbolical sense. For the most part, however, they refused to recognise it at all, and they gradually rejected the greater part of the New Testament also, substituting certain apocryphal books and spurious gospels of their own.

Gnu, any antelope of the South African genus *Catoblepas*. There are two species—*C. gnu*, the common, and *C. gorgon*, the brindled gnu. They are strange-looking animals: the neck is arched, with a hog-mane, the body and tail are not unlike those of a small pony, with deer-like limbs, and a buffalo-like hairy head, long beard, and hair between the forelegs. Both sexes bear horns. The common gnu is brownish-black, with white mane and tail. The brindled gnu, the larger species, is dun, with pale streaks. Gnus are said to be fierce, but the common species is domesticated without difficulty when taken young.

Goa, a city and territory on the Malabar coast of Hindostan, about 250 miles south of Bombay, with an area of 1,262 square miles. It was captured by Albuquerque in 1510, and is still held by the Portuguese. Rice is largely grown, but part of the province is covered by forest. At Goa are a fine cathedral and a church in which Xavier was buried; but the seat of government is at Panjim or Nova Goa, three miles farther west. In 1871 there was a rebellion, after which the native army was disbanded. The inhabitants are a mixed race, and are very dark-featured. A Portuguese patois is the usual language, but in a few families pure Portuguese is spoken. Roman Catholicism is almost universally professed.

Goajires, a large and independent nation in the State of Colombia, where they occupy the whole of the peninsula named from them, which projects between the Gulf of Venezuela and the Caribbean Sea; area 2,600 square miles. The Goajires, who are the Guajiros of the early Spanish writers, have maintained their autonomy in this region ever since the close of the 16th century, when they revolted against their white taskmasters, and expelled them from the country. They are a handsome race, robust and agile, with round face, almost regular features, black hair hanging in ringlets down to the shoulders, and of a brick-red complexion growing with years to a deep mahogany. The Goajires are hunters, fishers, dealers and traders, supplying the settled communities beyond the frontier with much local produce—cattle, fish, turtles, timber, dye-woods, salt, and corn in exchange for cotton fabrics and other manufactured wares. Their language shows strong Carib affinities, and the Goajires, who call themselves Guayu, are generally regarded as a branch of the widespread Carib family. (R. Paez, *Wild Scenes in South America*, New York, 1863; A. Ernst, *Die Goajiro Indianer in Zeitschrift für Ethnologie*, 1870.)

Goat, any individual or species of *Capra*, a genus of hollow-horned ruminants, almost exclusively confined to the rugged and mountainous parts of the Palearctic region, outside which only two species (one in Abyssinia and one in southern India) are found. Goats are closely allied to sheep, and the two groups have so many characters in common that it is difficult to frame definitions that shall mark them off clearly. The chief distinguishing marks of the goats are the laterally-flattened horns, keeled or with transverse ridges rising from the top of the head and curving backwards, the absence of tear-pits, the presence of a beard, and a peculiarly strong odour, especially in the males. To these must be added what Hodgson calls the "moral" distinctions: the "curious, capricious, and confident" nature of the goats, as contrasted with the "incurious, staid, and timid" disposition of the sheep. Not only do sheep and goats produce hybrids, but these hybrids are capable of perpetuating the mixed breed.

The domestic goat (*C. hircus*), with its numerous breeds, is probably derived from (*C. ægagrus*) the Bezoar goat, ranging from the Grecian Archipelago, where it is called the Ibex, to Persia, where its name is Paseng. It is of a greyish hue, shaded with reddish-brown, and has a dark dorsal stripe. The male stands about 33 inches at the withers, and the horns, which bear protuberances in front, may measure as much as 4 feet along the curve. The female is smaller, and has the horns less developed. It is said of this animal and of the Alpine Ibex that when accidentally falling they occasionally use their horns to break the shock.

Goats are hardy creatures, and will pick up a subsistence where sheep would starve; but they browse on shoots, twigs, and bark, and if kept near plantations will do a great deal of damage therein. A good she-goat will yield about two quarts of milk daily. The milk is made into butter and cheese, especially in mountainous countries and in the East. The flesh of young goats, or kids, is eaten; goat-skins make excellent rugs, and when dressed as leather are used for making gloves and boots; the horns are utilised for handles for cutlery; and from the fat excellent tallow is produced. Judges' and barristers' wigs are made of goats' hair, and from it ropes are spun that resist the effect of water. The Angora goat—a variety from Asia Minor—has long silky hair, from which camlets are made. The Cashmere goat, another variety, is a native of Tibet and Bokhara, and owes its popular name to the fact that its long hair is sent to Cashmere to be made into the celebrated Cashmere shawls. From these two varieties a third has been produced by crossing which yields longer and finer wool than the Angora or the Cashmere. The Syrian goat—a common Eastern form—is noticeable for its very long ears. The Markhore (*C. megaceros*) a wild goat from Cashmere and North-East India, is bluish-grey, with a long beard and mane, and immense spirally-twisted horns. It is popularly said to kill and eat serpents. The Tahr (*C. jemlaica*), from the Himalayas, is a fawn-brown, with long hair on the neck, chest, and shoulders. The horns are only about a foot long.

The Ibexes from the mountains of Europe and Western Asia are sometimes made a separate genus, from the fact that the horns are not keeled as in the true goats but have a series of transverse ridges in front. They are sometimes marked off into species, according as they are found in the Alps (*C. ibex*), the Pyrenees (*C. pyrenaica*), the Sierra Nevada (*C. hispania*), or the Caucasus (*C. caucasica*), but the first-named and the Paseng (*C. agagrus*) are probably the only good species. [ROCKY MOUNTAIN GOAT.]

Goat Moth (*Xyleutes cossus*, Linn.), a large moth having an expanse of wing of about four inches; it has a characteristic odour from which its name is derived. The caterpillar, however, is much better known than the moth; it has a large and reddish or flesh-coloured body and black head. It is well known owing to the damage it does to trees and gate-posts or other wooden erections. It burrows through these, and as several usually occur together, and they live for three or four years before entering the chrysalid stage, they often cause the complete destruction of the timber to which they have gained access.

Goatsucker, any bird of the Passerine family Caprimulgidae, with 17 genera containing 91 species. The Cuvierian and scientific names perpetuate the memory of an erroneous popular belief, dating from the days of Aristotle, that these birds suck the milk of goats. Goatsuckers are twilight insectivorous birds, owl-like in appearance, taking their prey on the wing. The gape is very wide, and set with bristles along the margin of the short-curved bill; the hind toe can be directed forward, and (except in the South American genus *Nyctibius*) the middle claw is serrated, though the purpose of this is not known. The plumage of all is exceedingly soft, generally shades of brown and grey, with delicate markings. The flight is swift and noiseless, and the cry weird—that of some species strangely resembling human utterance. [WHIPPOORWILL.] The common goatsucker (*C. europæus*) about ten inches long, widely distributed on the Continent, Asia, and North Africa, visits Britain in May, frequenting woody places, heaths, and fern-covered tracts, rearing its brood, and returning southward in September. From its haunts it is called the Fern-owl, and from its cry the Night-jar, Night-hurr, or Churn-owl. The Podargidae, or frog-mouths, chiefly from Australia, are closely allied to the goatsuckers, but are slightly larger, and have a wider gape. [GUACHARO.]

Gobelin, JEHAN (d. 1476), the first of a family of dyers, came to Paris about 1450, and there made a fortune. He built a house which was called *La Folie Gobelin* by people who thought his extravagance would ruin him. The family, however, continued to flourish, and in the 17th century began the making of that tapestry which has made their name famous. In 1662 the establishment was purchased by the Crown, and it is still carried on.

Goblin, the Kobold of German folk-lore, a capricious or mischievous spirit, a gnome. [BROWNE.]

Goby, any fish of the genus *Gobius*, type of an acanthopterygian family (Gobiidae) of small shore fishes common on temperate and more so on tropical coasts. Some frequent estuaries, and a few live in fresh water. In the type genus the body is sealy, there are two dorsal fins, and the ventrals are united to form a sucking disc, by which these fish can fasten themselves to rocks. The males of some species are not only nest-builders; they also watch over the nest after the young are born. There are about 300 species, several of which are British. The largest of these is the Black Goby (*G. niger*), and is about 5 inches long. Like the other British forms, it is often taken with a net in rock pools, and all these are frequently kept in aquaria. The White Goby (*Latrunculus albus*), a small transparent fish with teeth in one row, common in some parts of Britain and the Continent, is said to be the first recorded instance of an annual vertebrate, for the life-term is a single year. The same peculiarity has been observed in allied American genera (*Aphya* and *Crystalligobius*).

Godars, an outcast community, province of Mazanderân, Persia, of unknown origin. They are of darker colour than the Persians, and many of their customs resemble those of the Kols, Bhils, and other non-Aryan peoples of Central India. They are nominal Mohammedans, and now speak the Mazanderân Persian dialect. (Napier, *Tour in Khorasan*.)

Godavari, a river of India, rises in the Western Ghats near Nasik, and flows 898 miles in a southeasterly direction, till it discharges itself by seven mouths into the Bay of Bengal between the towns of Rajamundry and Masulipatam. Its breadth from where it is joined by the Pranbita to its separation into three streams varies from one to two miles, and the beautiful scenery of its lower courses has gained it the name of the Indian Rhine. There are three rapids in its upper course. The country forming its delta raises abundant crops. The Godavari is one of the twelve sacred rivers of India, and each of its mouths is considered holy.

Goddard, ARABELLA (b. 1836), one of the greatest of English pianoforte-players, was born near St. Malo. Her taste was formed by Mr. J. W. Davison, to whom she was married in 1860. She made her *début* in London on October 23, 1850. She was thought very highly of in Germany and Italy, and played for the last time in England in 1873, when she set out on a tour to Australia and the United States.

Godfather and Godmother, those who act as spiritual parents towards an infant presented for baptism. By making a *vow* on the child's behalf that he will lead a holy life, and *pledging* himself or herself to secure the fulfilment of that vow, the godparent becomes his *sponsor*. At first one only was required, and this is still the case in the Roman Catholic Church, although there are often more. In the Anglican Church two godfathers and one godmother are necessary for the baptism of a

male, and two godmothers and one godfather for that of a female. Parents are no longer forbidden to act as sponsors for their own children by the Church of England. In Catholic countries co-sponsorship constitutes a peculiarly intimate relation (the Old English gossiprede).

Godfrey of Bouillon, one of the greatest of the Crusaders, was born about 1061 in Brabant, and died in 1100 at Jerusalem. He served in the wars of the Emperor Henry IV., and was chosen one of the leaders in the First Crusade. When Jerusalem was captured the army wished to make him king of it, but he refused any other title but that of Defender of the Holy Sepulchre. In 1099 he defeated the Sultan of Egypt in the plain of Ascalon, and thus became supreme in Palestine. [CRUSADES.]

Godiva, LADY, wife of Leofric, Earl of Mercia and Lord of Coventry, is said to have obtained from her lord the remission of certain penalties imposed by him on the townsmen by riding naked through the town in the year 1040. There was a stained-glass window commemorating the occurrence in St. Michael's church, and the story used to be recalled to memory in the procession at Coventry fair. Leigh Hunt, Tennyson, and Robert Brough have written on this theme. [COVENTRY.]

Godolphin, SIDNEY, EARL (1645-1712), an English statesman, was born near Helstone, Cornwall. He early became a favourite of Charles II., and entered Parliament in 1668. Ten years later he was entrusted with a diplomatic mission in Holland, and in 1679 begun his connection with the Treasury. From this time forward he became one of the most influential ministers, and, though he voted for the exclusion of the Duke of York from the throne, he became Secretary of State in 1684, and when James came to the throne was only transferred from the Treasury to the Household. He was one of the last adherents of James II., but was, notwithstanding, made a Commissioner of the Treasury by William III. In spite of his known intrigues with the deposed king, he remained at the head of the Treasury from 1690 to 1696; and he was reappointed in 1700, though he was almost certainly known to have been involved in Sir John Fenwick's plot. He was appointed Lord High Treasurer by Queen Anne, and held that office for the first eight years of her reign, during which his management of the finances was of inestimable service to Marlborough, whose daughter had married his son. He had no fixed political principles, but was invaluable as an official who was not only able but, so far as is known, also incorruptible. Circumstances caused him and Marlborough to rely upon the support of the Whigs, and during the years 1708-10 the ministry was composed for the first time of one party in the state. Godolphin ranks as one of England's ablest financiers, but cannot be considered to have been a statesman of the first rank. A life of him by the Hon. Hugh Elliot, in which some incidents in his career are very leniently judged, appeared in 1888.

Godoy. [PRINCE OF THE PEACE.]

Godwin, FRANCIS (1562-1633), author of *The Man in the Moon; or, a Discourse of a Voyage Thither, by Domingo Gonsales, the Speedy Messenger* (1638, 1657, 1768), was born in Northamptonshire, and studied at Oxford. Having taken orders and held several benefices, he became Bishop of Llandaff in 1601, and of Hereford sixteen years later. The above-mentioned work showed the author's acquaintance with the Copernican system, and may quite possibly have suggested to Swift the "Voyage to Laputa" in *Gulliver's Travels*. Godwin's other works are forgotten.

Godwin, MARY WOLLSTONECRAFT (1759-1797), wife of William Godwin (q.v.), was the daughter of an Irishman of bad character, who spent a large fortune and left his daughters to go out as governesses. She met Godwin and Thomas Paine in London in 1791. Next year she went to Paris and made the acquaintance of an American named Imlay, with whom she lived for four years. When deserted by him she threw herself into the river at Putney Bridge, but was taken up by a passing boat. A few months after their separation she formed a connection with William Godwin, and though both disapproved of permanent unions, they were married before the birth of Mary, afterwards the wife of Shelley. Her name is now chiefly remembered by her *Vindication of the Rights of Women* (1792), the earliest demand for "women's rights;" but her *Letters Written in Norway, Sweden, and Denmark* have some merit.

Godwin, WILLIAM (1756-1836), author of *Political Justice*, was born at Wisbeach, being the seventh child of a Nonconformist minister. He was educated in Norfolk, whither his father had moved, but in 1773 came to London and entered Hoxton Academy. He next became a preacher, and held strong Calvinist views for some years. In 1783 he finally settled in London and engaged in literary work. While writing *Political Justice* he became an atheist, but afterwards professed belief in a vague Theism. The work was very successful, and had much influence on the young men of the day. Godwin was in general sympathy with the most advanced Whigs, and was intimate with Paine, Holcroft, and Horne-Tooke. He refused, however, to be a party hack; and Mackintosh, Dr. Parr, and others, who agreed with his politics, attacked his social views. These were further expounded in *Caleb Williams*, a novel (1794), which had some merit of style. Godwin first married in 1796 Mary Wollstonecraft (or Imlay), but lost her within a few months. In 1801 he married a Mrs. Clairmont, and supported not only his children by her and his first wife, but also their children by former husbands. In 1799 he published *St. Leon*, another novel, which had some success, and about this time had a controversy with Malthus (q.v.). In 1805 he and his wife set up a publishing business; but, in spite of the help of Lamb and others and the sums given or lent him by Shelley and Wedgwood, he never earned much more than a competence until in 1833 he obtained a sinecure from the Whig Government. The chief work published by him in his later years was a

History of the Commonwealth, in the composition of which the pamphlets in the British Museum were first utilised. As a dramatist Godwin failed signally, but obtained some success as a writer (under a pseudonym) of *Fables* for children.

Godwine (d. 1053). Earl of the West Saxons, an early English statesman, is said to have been the son of a certain Wulfnoth. Neither his parentage nor the date of his birth are, however, certainly known; but early in the reign of Cnut he was a powerful personage. He was made by him Earl of Wessex, and became the second man in the kingdom. He supported Harthacnut, but afterwards accepted Harold I. He used all his influence in the Witan to get Edward the Confessor elected king, and now became head of the English party in the kingdom. His daughter Eadgyth (Edith) was married to the king in 1045, but the Normans soon began to undermine his influence and the lawless deeds of his sons Swegen and Tostig were of great use to his enemies. In 1051 the Earl refused to avenge on Dover some insults that had been offered to the Normans, and he and his sons were outlawed. Next year he landed in the south, and was supported by the country-side. He sailed up the Thames, and, the Witan declaring him innocent, Edward gave him the kiss of peace. He died in all probability of an apoplectic fit.

Godwit (*Limosa*), a universally distributed genus of Scolopacidae. The species are not unlike curlews, but the bill has a slight upward, instead of a downward, curve. The females are larger than the males. They frequent marshes and estuaries, and feed in snipe-fashion by plunging their bills into the mud in search of worms and molluscs. Two species are English visitors: the black-tailed (*L. belgica*), and the bar-tailed godwit (*L. lapponica*). The former used to breed in England.

Goethe, JOHANN WOLFGANG VON, the brightest star in the literary firmament at the end of the eighteenth and the beginning of the nineteenth century, was born at Frankfort-on-the-Main on the 28th August, 1749. Though of humble descent on his father's side, his paternal grandfather having been a journeyman tailor, his grandfather on his mother's side, who stood godfather to him, and after whom he was named, held a high position in society, being Imperial Councillor and chief magistrate of his native city. The poet's own father, however, rose to be a lawyer of considerable distinction and took his degree of Doctor of Laws at the University of Giessen, and being a man of remarkable attainments, great common sense, and, moreover, of a retiring disposition, he was able to exercise a close supervision over the studies of his sole surviving son, whose character was to a great extent moulded and purified by such unremitting control.

But notwithstanding all this influence, apparently for good, young Goethe's education was conducted "not wisely but too well." For a youth of an impressionable and all-devouring nature, receiving and assimilating every production of literary genius, it was highly dangerous to wander, as he

did, over so wide a range of subjects, sipping the sweets of each, but exhausting the resources of none. The study of mathematics, music, languages, both ancient and modern, law, literature, and art in all its branches was surely sufficient to ruin anyone of a less robust mind than the young citizen of Frankfort. Lewes, in his *Life of Goethe*, tells us that he knew several handicrafts, and even learned the art of basket-making. But his wise and far-sighted mother kept him to some degree in check. In due course, at the age of 16, he was considered sufficiently advanced in his general studies to proceed to the university, and was entered at Leipsic in 1765 with the ostensible object of continuing his study of law. Leipsic was at that time the headquarters of the literary army, whither flocked the poets, critics, historians, and scientists of the day, the chief among whom were Gellert and Winckelmann; and Goethe—inwardly rejoiced to be free from the trammels of a somewhat pedantic and humdrum home life—absorbed and assimilated impressions from without and, remodelling and reconstituting them, gave them to the world in a new dress in the various forms of pastoral (*Die Laune des Verliebten*—*The Lover's Caprice*), comedy (*Die Mitschuldigen*—*The Fellow-Sinners*), and prose (*Confessions*). At Leipsic he remained little over three years, when a somewhat severe illness, brought about by excesses and low diet, occasioned his return to Frankfort. From this illness he speedily recovered, but a gloomy melancholy settled on his mind, and mysticism and theosophy for a time hampered his progress to a higher sphere.

A turning-point in Goethe's career took place, however, when he entered in 1770 the University of Strasburg and made the acquaintance of Herder, then initiating a new departure in the realm of poetry. We refer to that epoch in the literature of Germany, styled, after a drama of Klinger's, the *Sturm und Drang* (or *Storm and Stress*) period, which lasted from 1767 to 1781, and of which Herder was the most striking exponent. It was an attempt to supplant the poetry of art by the poetry of nature, to go back to the earliest periods, when the poetry of the people sprang from the heart of the people, and the false, the artificial, the manufactured, the studied was to be a thing of the past. Here, too, Goethe had his first serious love affair with Frederike Brion, the daughter of a neighbouring pastor, which, though little more than a youthful fancy, inspired some of his noblest lyrics. At Strasburg he took his degree of Doctor of Laws in due course, and returning to Frankfort in 1771 completed his legal education at the court of the Imperial Chamber in Wetzlar. On his return to his native city he brought out in 1773 his first work of any importance, the drama of *Götz von Berlichingen*, the most brilliant outcome of the new ideas, and a severe shock to the adherents of the old French school. In it Goethe presents to us vivid pictures of the Peasants' War and the *Vehgericht* or Secret Court of the Middle Ages. Shortly afterwards followed the *Sorrows of Werther* (*Die Leiden des jungen Werther*), the disburdening of a mind at that time full of

melancholy thoughts. This work created a great sensation, and Napoleon is said to have carried it with him on his campaigns. It was succeeded by a number of minor productions, chief among them being the tragedy of *Clavigo*. Goethe now sought consolation for an unhappy love affair in a journey to Switzerland and commenced on his return the tragedy of *Egmont*. It was during this period, too, that his grandest conception, *Faust*, issued first as a fragment and subsequently as a tragedy, was springing into life and assuming the noblest proportions under the hand of a master.

And now came an important period in Goethe's career. Previous to his journey to Switzerland he had, at their request, been introduced to the young Princes of Weimar by Major von Knebel, the friend and mentor of the younger, and in 1775 Charles Augustus, having come of age and entered upon the government, invited the poet to his court at Weimar. Hitherto his mother, the Regent Anna Amelia, had been one of the most zealous patrons of literature, and to her select circle, among whom only Wieland, Herder, and subsequently, from 1799 till his death in 1805, Schiller need be mentioned, we may be sure that Goethe was a most welcome addition. It was here, too, that he met Frau von Stein, who exercised a considerable influence over her admirer. At the court of Weimar he held for some time an inferior position, until in 1779, at the age of 30, he received the appointment of Privy Councillor. Three years later he was made President of the Chamber and enrolled among the lower nobility (*i.e.* those who receive the title of *von*); but the poet felt that he could not give his heart to the dull routine of official business, and that his interests lay in another direction. His generous patron, who appreciated his feelings, gladly therefore accorded him a lengthened leave of absence, and he was enabled in 1786 to fulfil a yearning which for some time past had taken complete possession of him, that of visiting Italy. For various reasons, however, he kept his destination a secret from his friends, and, as he himself tells us, "stole forth from Carlsbad" to the land of song. Here he remained for about two years, visiting Venice, Rome, Naples, and Sicily, of which he has given us a most remarkable description in his two books the *Italienische Reise* (1814) and *Italien*, collections of extracts from letters to his various friends. In Italy alone was he able to study art and nature in its purest and sublimest forms, while his literary genius by no means lay dormant. Previous to his departure he had brought out four volumes of his collected works, and while engaged in the issue of the remainder he rewrote in the form of verse his *Iphigenia auf Tauris* and *Torquato Tasso*, both originally composed in prose, and completed in Rome his tragedy of *Egmont*, besides several other minor productions.

On his return to Weimar studies in natural science engrossed his attention, and he began to feel that the life of a court official was highly unsuitable to his tastes. The French Revolution, too, made a deep impression on his sensitive nature, filling his mind with gloomy forebodings,

and in his *Reinecke Fuchs*, an adaptation of an ancient fable, he gave vent to a feeling of bitter resentment against mankind. About this time appeared the first instalment of *Faust*, but receptive as men's minds were for revolutionary ideas, this undue exaltation of supernatural powers met with no very cordial reception. Gradually, however, its purport came to be better understood, as realising the workings of the poet's mind. In 1794 appeared the first volume of *Wilhelm Meisters Lehrjahre* (apprenticeship), notable, among other excellencies, for the finest criticism of *Hamlet* extant. The first six books of this work were, however, written before his departure for Italy. This year was an important epoch in the poet's life, as marking the commencement of his friendship with Schiller, which lasted till the death of the latter in 1805. Goethe contributed largely to periodicals issued by his friend, and some of these publications having met with an indifferent reception, they resolved to take vengeance on their critics and exposed the degraded literary taste of the day in a series of epigrams called *Xenien*, which created at the time a profound sensation. The novel of *Wilhelm Meister* was completed two years after the issue of the first part, and was followed by *Hermann und Dorothea* in 1797. This is an "idyllic poem" in hexameters founded on an episode in the career of some Salzburg refugees, but transported to the period of the French Revolution. For some time past Goethe had been endeavouring, in conjunction with Schiller, to introduce reforms on the German stage, and himself undertook the management of the Weimar Theatre. Although nothing of importance appeared after the death of his friend, unless we except the second part of *Faust* and the first edition of *Wilhelm Meisters Wanderjahre*, a work much inferior in every respect to the *Lehrjahre*, his literary activity was never allowed to slumber. Many of his former publications were revised, and his Italian correspondence collected and collated. With the words "More light!" on his lips, he passed away peacefully on the 22nd March, 1832, at the age of 83 years.

The greatness of Goethe's genius no one will call in question. Before his appearance German literature was at its lowest ebb, nothing worthy of the name having appeared since the earliest traditions of the nation embodied in the *Lay of the Nibelungs*. Goethe marked the beginning of a new epoch, stimulating and furthering the tastes of the nation not only by what he himself produced, but by the all-pervading influence of his personal character. A man of such universal genius—genius not impaired by its universality—is a rare phenomenon. Science, literature, art, all came within his ken. It is owing to the fact that he was able, as Emerson expresses it, to cope with a rolling miscellany of facts and sciences, and by his own versatility to dispose of them with ease, that he exercised such a vast and beneficial influence over the literature of his country. (For a full account of his life and works see G. H. Lewes *Life of Goethe*, a standard work, and Dünzer's *Life of Goethe*, translated by T. W. Lyster.)

Goffe, or GOUGH, WILLIAM (d. 1679 ?), a notable historical and legendary character of the 17th century, was an officer in the Parliamentary army during the Civil War. He was prominent at the meeting of officers which decided to bring Charles I. to trial, and, as one of the king's judges, signed the death-warrant. He was one of Cromwell's major-generals, and a member of the new House of Lords, and received a grant of Irish land for his services. When at the Restoration he was excepted from the Act of Indemnity, he escaped to Massachusetts, but even there had to remain in hiding. Tradition says that when in 1675 the station of Hadley was attacked by Indians he suddenly appeared and rallied the settlers—a story made use of by Scott (*Peveril of the Peak*) and Fenimore Cooper.

Gog and Magog, names given to the giants in the Guildhall. The figures now to be seen were made in 1708, the old ones, which dated from the reign of Henry V., having perished in the Fire of London. There are various stories about them, but in Caxton's story Gog and Magog are the last two descendants of a race of giants who were conquered by Brut the Trojan, who made the two prisoners porters in his palace in London. In the Bible Magog is sometimes a man and sometimes a country, as in Ezekiel (xxxviii.). In Revelation (xx.) Gog and Magog together represent the nations opposing the triumph of the Kingdom of God. The Gog-Magog hills, near which there are traces of a Roman camp, are in south-east Cambridgeshire.

Gogol, NICOLAI VASILIEVITCH (d. 1852), a Russian realistic writer, was born at a village in the province of Poltava in 1809 or 1810. He went to St. Petersburg in 1829, hoping to earn a living by his pen, and two years later became known by his *Evenings in a Farm near Dikanda*. In 1834 he issued a second series, some of the tales in which have been translated into English. In 1837 appeared his *Dead Serfs* (translated into English in 1887), a picture of provincial life which is considered Gogol's *chef-d'œuvre*. A year before he had satirised Russian officialism in a comedy, *The Revising Inspector*. He had himself had some experience of office, and he also lectured at St. Petersburg on history. He lived abroad (chiefly in Italy) for some years, but returned to Russia in 1846, and died at Moscow in 1852. His correspondence and collected works were published in six volumes (1856–57). Gogol was intimate with Pushkine, who had much influence on his writings. His popularity in Russia was second only to that of Turgenieff.

Gohelwar, a district forming the eastern coast of Kattiwar Peninsula, Presidency of Bombay. It has an area of about 4,000 square miles.

Goitre, BRONCHOCELE, the term applied to diseases of the thyroid body. The thyroid body or gland is situated in the neck, and consists of two lobes, with a connecting middle lobe or isthmus, which lies just in front of the windpipe. The gland substance is richly supplied with blood-vessels,

and consists of a number of vesicles (thyroid vesicles) which are filled with a transparent material (colloid substance). Isolated cases of goitre are met with in all parts of the world, but the disease occurs with especial frequency in certain localities, in which places it is therefore said to be *endemic*. In the Swiss valleys, and in certain parts of the Himalayas, goitre is common. In England it is much more rare, but affects certain counties, notably Derbyshire, whence the name "Derbyshire neck." Apart from the disfigurement caused by the tumour, goitre may produce certain serious consequences, notably, it may give rise to symptoms caused by the pressure exerted upon important structures, which lie in the neck in close juxtaposition to the thyroid gland. The most frequent "pressure effect" produced by a thyroid tumour is constriction of the trachea or windpipe, leading to difficulty of breathing; this symptom is most commonly associated with enlargement of the middle lobe of the thyroid body. In the treatment of goitre the most effectual remedy is, no doubt, the removal of the patient from the locality in which the disease was contracted; if this be impossible, attention should be directed to the water supply, as there is little doubt that it is through the medium of drinking water that the disease is produced. Cysts may be evacuated by puncture. When the trachea is compressed and asphyxia is imminent, tracheotomy may be called for, and in some instances the attempt has actually been made to extirpate the whole tumour; this latter proceeding involves no little danger, so richly, as a rule, is the swelling supplied with blood-vessels.

Goklâns, a large division of the Turkoman people, whose territory lies in the Upper Attrek and Gurgan river valleys between Kizil Arvat and Askabad on the Russo-Persian frontier. Chief *taife* (subdivisions): Chakir, Begdli, Kazi, Karabalkan, Kyruk, Bajindir, and Yangak, including a branch in the Persian province of Mazanderân.

Golconda, a fortified town in Hindostan, seven miles north-west of Hyderabad. It was formerly the capital of a kingdom of the same name, but is now the chief town of the Nizam's dominions. There were gold and diamond mines in the neighbourhood of the city, and the latter were cut and polished at Golconda.

Gold, a metal valued on account of its scarcity, colour, lustre, and power of resisting oxidation. It is represented chemically by the symbol Au, from its Latin name, *aurum*, and it has an atomic weight of 196.5. It is the only metallic element of a yellow colour. Its hardness when pure is about 2.5, and its specific gravity about 19. It is the most malleable of metals, the thin leaves appearing green by transmitted light. Its weight and malleability serve to distinguish it from many other substances, especially iron-pyrites. Gold is also extremely ductile, and can be welded readily when cold. It does not dissolve in the simple acids, but will do so in aqua regia (q.v.), forming a yellow solution of auric chloride (AuCl₃). From this solution it is precipitated as a soft brown powder by

ferrous sulphate (FeSO_4), as a dark-brown sulphide by sulphuretted hydrogen, or most characteristically as "purple of Cassius" by stannous chloride (SnCl_2). Gold is chiefly obtained "native," i.e. uncombined; in which state it is sometimes in small octahedral crystals belonging to the Cubic system, sometimes dendritic, or in grains or veins disseminated through quartz-rock; but more commonly in dust-like particles or in rounded water-worn lumps or "nuggets" in alluvial deposits. In accordance with these two chief modes of occurrence, gold-mining is either vein-mining and quartz-crushing, or what is known as "placer-mining." This consists in repeated washings of the auriferous gravel or "pay dirt" in a "pan," "cradle," or "sluice," and passing it over mercury, with which the gold unites or amalgamates. The mercury can subsequently be readily driven off by heat, leaving the gold. The auriferous gravels are sometimes quarried on a large scale by a hydraulic jet. Auriferous quartz-veins occur generally in slates or talcose or chloritic schists: alluvial gold is commonly associated with grains of quartz, platinum, osmiridium, tinstone, chromite, magnetite, zircon, topaz, sapphire, garnet, and diamond. There is hardly a geological formation or a country in the world in which some gold has not been found in one or other of these forms. It occurs in Cornish stream-tin works, in granite in Wicklow, in Sutherland, and in quartz-veins in Carmarthenshire and Merionethshire. At Tchenmiz in Hungary veins occur in Tertiary trachytes, and in Transylvania even in sandstone. The more important Ural workings are both in veins in Palæozoic rocks and in alluvium of later Tertiary age. From Mexico to Alaska, one of the richest auriferous regions on the globe, the gold is largely in river-terraces of Pliocene or Pleistocene age; but in California auriferous veins also occur in rocks probably of Triassic age. Most of the gold of Africa is alluvial; but auriferous quartz-veins occur in the Transvaal in talc-schists associated with diorite, probably Silurian or Devonian in age. In Australia the vein-gold seems all of Lower Palæozoic age; but there are also important Tertiary alluvial deposits. Next in importance to the native metal as a source of gold is iron-pyrites, in which the precious metal is probably not chemically combined. Gold also occurs in arsenical pyrites, in galena (q.v.) and with silver in certain tellurides, such as sylvanite (q.v.), calaverite, named from Calaveras in California, and nagyagite, from Nagyag in Transylvania. Most of the gold of Brazil occurs in pyrites. The chief gold supply of the world is at present derived from the United States, Australia producing about three-quarters as much.

Gold-beater's Skin, a membrane prepared from the outside coat of the great intestine of the ox. Its tough consistency renders it suitable for being placed between the leaves of gold while they are being beaten. It thereby becomes extremely thin, and may be afterwards used in dressing wounds.

Gold-beating, the process by which gold is beaten into leaves for gilding. As gold-leaf was

used in the East for gilding (q.v.) at a very early period, the method by which it is prepared must also have been known. Gold-beating was formerly a thriving industry at Florence, but it has much declined there of late years, owing to the production of inferior but cheaper gold-leaf in France and Germany. A considerable amount is made in England, especially in London. The first step in the preparation is to alloy the gold with silver or copper, the amount of which varies with the colour desired. It is then cast into ingots, and each ingot is rolled into a ribbon about $1\frac{1}{2}$ inches wide. These are cut into pieces which are interleaved with squares of coarse paper. A leaf of vellum is introduced here and there instead of the paper. The packet formed in this way, termed a "cutch," is laid on a marble surface and beaten with a hammer weighing about 16 lbs. Much exertion is saved through the elasticity of the vellum, which causes the hammer to rebound. When the pieces of gold have become equal in size with the squares of paper, they are removed and cut into four pieces. These are interleaved with gold-beater's skin so as to form a "shoder," and the same process is repeated, but in this case a 9-lb. hammer is used, and the beating is continued for a longer time. The pieces thus beaten out are in their turn cut up, and a packet called a "mould" is formed by interleaving about 950 of them with fresh gold-beater's skin. A final beating then takes place with a 7-lb. hammer, lasting for four hours. The leaf is thus reduced to a thickness of about $\frac{1}{282000}$ inch. An ounce of gold when beaten out sometimes covers over 200 square feet.

Gold Coast, a stretch of sea-board on the Gulf of Guinea, West Africa, about 300 miles in extent, having the Ivory Coast on the west, and Dahomey on the east. It derives its name from the gold-dust brought by the Ashantis from the interior and sold to traders. The climate is unhealthy, and the coast dangerous owing to the heavy surf. Besides gold, palm-oil, cocoa-nuts, and ivory are objects of barter. The inhabitants consist almost entirely of negroes, governed by their own chiefs; but the whole territory is under the protection of a British Governor residing at Christiansborg.

Golden Apple Beetles, a family of beetles of which the best known English representative is *Chrysomela cerealis* (Linn.). This is of a bright gold colour streaked with bands of blue and green. It is commonest in North Wales.

Golden-crested Wren, a somewhat misleading name for *Regulus cristatus*, the kinglet, a warbler approaching the tits in habit. It is a native of Britain, and numbers also visit us in the winter from the north of Europe, over which continent it is widely distributed. It is the smallest British bird, being little more than three inches long. The plumage is yellowish-green above, and light grey beneath, and the saffron feathers on the crown form a crest; the tints are duller in the hen bird. *R. ignicapillus*, the Fire-crested Wren, is an occasional visitor.

Golden Fleece, in Greek mythology, was the fleece of the ram Chrysomallus, which the Argonauts sought to obtain in their expedition to Colchis. An order of knighthood with this title was instituted by Philip III., Duke of Burgundy, in 1429. The selection of the fleece as a badge is perhaps explained by the fact that the manufacture of wool had long been the staple industry of the Low Countries, then a part of the Burgundian possessions. The office of Grand Master was held by Philip himself, and became hereditary in his family. There were thirty-one knights, who filled up vacancies by co-optation, but the right of election was transferred by Gregory XIII. to Philip II. of Spain, at that time Grand Master. Early in the 18th century a dispute concerning the possession of the order arose between Philip V. of Spain and the Emperor Charles VI., who then held the Netherlands. It was eventually settled by the establishment of the order both in Spain and Austria.

Golden Legend, a collection of lives of the chief saints, written by Jacobus de Voragine (1230-98), who at the time of his death was Archbishop of Genoa. It has been translated from the original Latin into most of the European languages. An English version by Caxton was published in 1483.

Golden Number. The discovery of the Greek astronomer Meton in 432 B.C. that a period of 19 years brought the sun, the earth, and the moon approximately into the same relative positions, furnished a convenient means of marking time. The number of a year in the Metonic Cycle became known as the Golden Number from the circumstance that in the Roman and Alexandrian calendars these numbers were inscribed in gold. When the Gregorian calendar was adopted, the 1st of January of the year 1 B.C., on which day there was a new moon, became the starting-point from which the Metonic Cycles were reckoned. The golden number of a year may therefore be ascertained by adding 1 and dividing by 19; the quotient gives the number of previous cycles, and the remainder the number of the year in the present cycle.

Golden Oriole. [ORIOLE.]

Goldfinch (*Carduelis elegans*), a common European and British finch, valued as a cage-bird for its fine plumage and sweet song. The male, about 5 inches long, has the back and rump dusky brown, mixed with black, the greater wing-coverts gamboge yellow, the nape white, top of the head black, and a crimson patch at the base of the bill. They are generally found in small flocks, and produce two broods in a year. The young are fed on insects, but the old birds are chiefly seed-eaters.

Goldfish, GOLDEN CARP (*Carassius auratus*), a Chinese and Japanese fish introduced in England towards the close of the 17th century. It is naturally brownish, but in a domesticated condition it becomes a rich gold colour. Albinos often occur, and are known as Silver Fish. Both forms are kept in aquaria.

Goldi, a Mongolic people of north-east Asia, Amour basin, settled chiefly along the right bank of the main stream between the Sungari and Gorin confluences, and also in the Usuri river valley. The Goldi, who are a branch of the Tungus race [TUNGUS], are the Yu-pi-ta-tze or "Fish-skins" of the Chinese, being so named from their national costume, a long flowing robe of Chinese pattern made of prepared salmon skins. They live entirely by fishing and hunting, varying their fish diet with a little rice or millet, which they receive from the Manchu and Chinese dealers in exchange for peltries and dried fish. They cultivate no land, and keep no domestic animals, except a few cats, pigs, and a breed of dogs like those of the Eskimo. Nevertheless, they are very fond of animals, keeping menageries of bears, wolves, and foxes, and aviaries of wild ducks, geese, and eagles. The type is distinctly Mongolic, marked by a yellowish complexion, flat features, short stature, and black, lank hair. (Venukof, in *Petermann's Mittheilungen*, 1862.)

Gold Leaf Electroscope, in *Electricity*, is an instrument that estimates the potential of a quantity of electricity by the divergence produced of two strips of gold leaf that hang from the charged conductor. [ELECTROSCOPE.]

Goldoni, CARLO (1707-93), an Italian comic dramatist, was born in Venice, at which place and at Pavia he studied law. In 1732 he produced a successful tragedy, but soon forsook this department of dramatic art for that of comedy. In the course of twenty years he wrote more than 100 pieces, among which were:—*Zelinda e Lindoro*, *La Bottega di Caffè*, *Dama Prudente*, and a trilogy called *Villeggiatura*. In 1761 he was engaged to write for the Italian theatre at Paris, and during his residence there taught Italian to the daughters of Louis XV.

Goldschmidt, MADAME (1820-1887), a great Swedish singer, better known as JENNY LIND, was born at Stockholm. In spite of her parents' poverty she had lessons in the Court theatre from the age of nine, and, after a successful *début* at eighteen in *Der Freischütz*, continually sang before royal audiences. In 1841 she studied under Manuel Garcia at Paris, but her first appearance there was a failure. She then studied German at Berlin, to which city she returned after a short stay in Stockholm. In 1846 she sang at Vienna, and in 1847 made her first appearance in London, to which she returned a year later, and again in 1849. She went on an American tour under Barnum's management in 1850-52, and married her pianist, Otto Goldschmidt, in the latter year. On her return to Europe she confined her appearances to concerts and oratorios, and left the stage. She lived chiefly in London and Malvern, and was Professor of Singing at the Royal College of Music from 1883 to 1886. From the proceeds of her American tour and other engagements she founded the Mendelssohn scholarship, and also gave a hospital to Liverpool. She also interested herself greatly in the Bach Choir conducted by her husband. She was called the "Swedish Nightingale," and, from the accounts written of her voice

by those who had heard it, seems to have deserved the name.

Gold-sinny, GOLD-FINNY (*Crenilabrus melops*), a common British Wrasse of small size, living near rocks and feeding on molluscs and crustaceans. There is a dark spot behind the eye, the back is purplish, the under-surface greenish, and the sides of the head red. The pre-operculum is denticulated.

Goldsmith, OLIVER, was born on the 10th November, 1728, at Pallas or Pallasmore, in county Longford, but his father, a clergyman, soon obtained the living of Kilkenny West, and the boy was brought up in the neighbouring village of Lissoy. At seventeen he entered Trinity College, Dublin, where he led a careless life. After taking his degree, he lived at home for two years. He tried to take orders, but, for unknown reasons, was rejected by the bishop. Then he held a tutorship, and made an attempt to emigrate, after which an uncle came to the rescue, and started him to study law at the Temple with £50. This, however, he spent in Dublin, and his uncle sent him to learn medicine in Edinburgh. There he remained from 1752 till 1754, after which he spent ten months at Leyden, at the end of which, being penniless, he thought that a tour might be enjoyable. He wandered to Italy, supporting himself by playing the flute and by other mysterious means. In 1756 he reached London, where he continued his hand-to-mouth existence, as a doctor, as a corrector of the press for Richardson, and as usher in the school of Dr. Milner at Peckham. It was in this school that he stumbled on literature as a profession. A bookseller, Griffiths, dining there, was so much struck by his ability that he employed him for board and lodging and a trifle of money to write in *The Monthly Review*. For five months this arrangement lasted, after which Goldsmith set up as a literary man on his own account, but soon drifted again to Peckham, then back to literature, until Dr. Milner obtained him the promise of a medical appointment on the Coromandel Coast. This prospect, however, was not realised, and after failing to pass an examination as "hospital mate" Goldsmith returned to his books. In 1759 he published his first original work, *An Inquiry into the Present State of Polite Learning in Europe*, and eight numbers of weekly essays in *The Bee*. In 1760 he brought out in *The Public Ledger* a series of letters from an imaginary Chinaman, which were so successful that they were republished in 1762 as *The Citizen of the World*. The year 1761 was marked by his first visit from Dr. Johnson, and in 1763 he became one of the original members of "The Literary Club," where he met Reynolds, Burke, Garrick, and other notable men. His anonymous *Letters from a Nobleman to his Son* made, at this time, a great success. He had now reached his great period of production. *The Vicar of Wakefield* was sold to a publisher in 1764 and published two years afterwards. His two best-known poems, *The Traveller* and *The Deserted Village*, came out in 1764 and 1770, and his two comedies *The Good-Natured Man* and *She Stoops to Conquer*, in 1767

and 1772. Meanwhile, reckless in expenditure, and ready to give his last guinea to anyone in distress, the poor genius was sinking deeply in drudgery and debt. He wrote much for booksellers, even long histories of Rome and of England, and a compilation in eight volumes on *Animated Nature*, and earned sums which would have kept an ordinary man in comfort. Anxiety, however, darkened his closing days, and he died on the 4th April, 1774. Soon after his death his unfinished poem *Retaliation* was published. As a writer Goldsmith has a perennial charm. Original alike in poetry, fiction, and comedy, he stamped his work with the perfection of order in which his life was lacking, and with the simplicity, the sensibility, the humour and wisdom which have endeared him as much to those who have succeeded him as to his own generation.

Goldstücker, THEODOR (1821-72), a German Sanskrit scholar, was born at Königsberg. He came to England in 1850, and was from 1852 till his death Professor of Sanskrit at University College, London. He founded the Sanskrit Text Society, and wrote *Panini: His Place in Sanskrit Literature*, part of a Sanskrit dictionary, etc.

Golf. [LINKS, PUTTING, SCOTLAND.]

Goliath Beetles, a group of beetles found principally in tropical Africa; it includes many of the largest known beetles. The members of the group are often brilliantly coloured.

Goloshes, outer shoes of indiarubber, invented in America, which came into use in England about 1847. They were at first unsightly and awkwardly made, but improvements in the manufacture were soon introduced. Large quantities are now produced at the works of the North British Rubber Company in Edinburgh. The rubber is first of all torn into shreds, which are washed, and rolled together, so as to form granulated sheets. It is then mingled with sulphur, litharge, and other vulcanising materials by means of heated rollers. This rolling is afterwards repeated till the thickness necessary for the shoe uppers is obtained. The soles and shoe uppers are cut out, one at a time, with knives. Dissolved rubber, or some other adhesive cement, is applied to the edges of the linings, which are usually of calico, after which the various pieces are joined together. The latter part of the work is done by women or girls. Varnish is used to give a gloss to the shoes, which are completed by exposing them for nine hours to a temperature of 200° or 300° F.

Gonaquas, a South African people of mixed Hottentot-Kafir descent, who are scattered in small groups over the eastern provinces of Cape Colony, and especially about the Kafir frontier, whence their name, which in Hottentot means "Borderers." Both in features and in speech they retain most of the Hottentot characteristics, although their taller stature, more dignified carriage, and darker complexion betray the Bantu strain in their blood. But despite these affinities they formerly lived in a chronic state of warfare with their Kafir neighbours, by whom they were at one time threatened with total extermination. At present they live in peace

under the British administration, and most of them have been converted to Christianity. The *karas*, or national costume of undressed ox-hides, has been exchanged for European garments, and their conic huts little over 5 feet high replaced by more commodious wood or brick dwellings. (Fleming, *South Africa*, London, 1856; Fritsch, *Die Eingeborenen Süd-Afrika's*, Breslau, 1872.)

Goncourt, EDMOND DE (1822–88), and JULES (1830–70), two French novelists, whose works are, perhaps, the most successful result of collaboration ever seen. The former was born at Nancy and the latter at Paris. Before writing fiction they published a series of sketches dealing with the history of the 18th century, the chief of which were *Histoire de la Société Française pendant la Révolution* (1854) and *Portraits Intimes du XVIII.^e Siècle* (1856–58). In after years they also produced *La Femme au XVIII.^e Siècle*, and some artistic studies, *L'Art au XVIII.^e Siècle* (1874), and studies of Watteau and Proudhon by the elder brother only. Their first novel was *Les Hommes de Lettres* (1860); and the best of their joint productions were *Renée Mauperin* (1864), *Germinie Lacerteux* (1865), and *Madame Gervaisais* (1869). Jules died on June 20, 1870, but Edmond wrote after his death *La Fille Elisa*, which had both merit and popularity, and several other works. The letters of Jules were given to the world in 1885, and the *Journal* of the brothers appeared in complete form in 1888. Their artistic was of greater value than their historical work.

Gondar, a town in the centre of Abyssinia, 30 miles north of Lake Isana. It was formerly a large town in which the Emperor resided; it was partially burnt by the Dervishes in 1889. Gold and silver filigree-work, musical instruments, and fine leather are made here; and there are forty churches.

Gondokoro, on the Upper Nile, about 150 miles north of the Albert Nyanza, is a centre of the ivory trade. It was formerly also a great resort of slave-traders, but Baker put down this traffic in 1871.

Gondola, a long narrow boat, with high, curved prow and stern, which gradually diminish in width and end in a point. The gondolier stands at the stern, and propels the boat by means of a large and very powerful kind of oar. They are a striking object on the canals at Venice.

Gonds, a large division of the Dravidian race, who give their name to the region of Gondivâna, comprising both slopes of the Vindhya Mountains in Central India. As indicated by their name (either from a Sanskrit word meaning "cave-dwellers," or else "highlanders" from the Telugu *konda*, "mountain"), the Gonds belong to the primitive population of the peninsula, and are the most numerous and widespread of all the uncivilised Indian peoples. They are distinguished by a very dark complexion—some of the tribes being almost black—with straight black hair, somewhat broad flat features, round face, and low stature, averaging little more than five feet three inches. But the type varies considerably amongst the

different tribes, of which the chief are: Badiya, Koram, Paoli, Murpasi, Siamb, Markand in the Korea Hills and Sirguja; Raj Raghawal Dadave, Katulya, Padal, Dholi, Ojhyae, Thokyal, Koikopal, Kolam and Madyal in the Central Provinces; Marias, Hulbas, and Badiyas in the southern dependencies. All speak dialects of the rude uncultivated Gondi language, which has lately been reduced to writing by the missionaries. In it have appeared two of the gospels and other parts of Scripture in the Devanâgari character. The tribal affairs are regulated by a council of elders under a *thakur* or chief usually of Rajput origin. Their religion is of an extremely primitive type, and presents some curious features, such as the worship of small-pox, the cholera, fever, the tiger and other personified malevolent influences represented, not by idols, but by small blocks of stone disposed in a circle round some gigantic forest tree. These monoliths are still smeared with a red ochre to represent the blood of the animal or human victims formerly sacrificed to avert their wrath. But many are now Christians or worshippers of Siva, Vishnu, and the Hindu divinities. They cultivate a little land in a nomad sort of way, moving from place to place according as the soil gets exhausted. But their chief dependence is on wild fruits, roots, the edible flowers of the mhowa tree, and all kinds of game, which still abounds in the forests of Gondivâna. (Captain Forsyth, *The Highlands of Central India*, 1871; Charles Grant, *Gazetteer of the Central Provinces*; Rev. J. Caine on *The Kois or Gonds* in *Journal of the Royal Asiatic Society*, February, 1881.)

Gongora, LUIS DE GONGORA Y ARGOTE (1561–1627), a Spanish poet, was born at Cordova. He studied law at Salamanca, but eventually took orders, and became chaplain to Philip III. He wrote sonnets, lyrical poems, and guitar-songs, and in his later works was decidedly euphuistic, like the earlier Elizabethans in England. An incomplete edition was published in the year of his death, and in 1659 a complete edition appeared at Brussels. *Solidades* and *Pyramo y Thisbe* are the names of two of his longer poems.

Goniatites, the type genus of the *Goniatitidae*, a family of Cephalopoda with coiled shells resembling those of the Nautilus but in which the sutures are angulated instead of wavy. The family is extinct, and flourished most in the Carboniferous period, though it survived till the Triassic.

Gonidia, green cells leading an independent existence, being, in fact, unicellular Algæ (q.v.). They are generally spherical, and have seldom a defined cellulose membrane. In addition to chlorophyll (q.v.) they sometimes contain phycocyan or other colouring matters. The term is especially applied to those algal cells belonging to various members of the sub-classes Cyanophyceæ and Chlorophyceæ, which, imprisoned by the hyphæ of various fungi, constitute the symbiotic compound organism known as a lichen (q.v.).

Goniometer is an instrument chiefly used in crystallography for the measurement of solid

angles, the best known being those of Carangeau and of Dr. Wollaston.

Goniophyllum a well-known genus of corals from the Silurian rocks. It is characterised by its well-marked quadrilateral shape; the internal structure is of the type known as "vesicular," while the septa are distinct plates or laminæ, and not mere striæ. [CORAL.]

Gonorrhœa, a disease characterised by inflammation of the mucous membrane of the genital passages with purulent discharge. The malady is now known to be due to a specific micro-organism, and infection is transmitted from one subject to another by direct contagion. The inflammatory mischief is accompanied by great pain in the acute stage, and chronic trouble is apt to be left behind after the force of the disease is spent—a thin watery discharge sometimes persisting for years. Matters are sometimes complicated by the super-vention of an exceedingly intractable affection of the joints known as gonorrhœal rheumatism, and among the sequelæ of the disease stricture of the urethra may be mentioned as a frequent and distressing after-trouble in the male subject. The serious nature of the malady urgently demands that the sufferer should obtain proper medical advice from the outset, and on no account should reliance be placed in any quack remedy. The discharge in the acute stage is eminently contagious, and is capable of being inoculated upon the mucous membrane of the conjunctiva. When such a mishap occurs severe inflammation is set up (gonorrhœal ophthalmia), and loss of sight is then no uncommon result.

Gonsalvo di Cordova (1453–1515), a great Spanish general, whose real name was GONZALO HERNANDEZ Y AGUILAR, was born near Cordova. He distinguished himself as a soldier in the wars with the Moors and Portuguese, and conducted with great skill the negotiation with Boabdil, King of Granada, with which the former closed. He afterwards drove the French from Italy for Ferdinand II. of Naples, and gained by his exploits the title of "the great captain." In 1500 he recaptured Zante and Cephalonia from the Turks, and three years later again commanded against the French in southern Italy. By the victory of Garigliano (December 29, 1503) he re-established the Spanish kingdom of Naples, of which he was appointed Viceroy soon afterwards. In Spain, however, his enemies intrigued with success against him, and when recalled he thought it best to retire to his estates in Granada, where he died.

Gonzaga, the name of a ducal dynasty at Mantua and Montferrat. LUIS GONZAGA ousted the Bonacossi family from the lordship of Mantua in 1328, and GIOVANNI FRANCESCO (1394–1444) was created Marquis by the Emperor Sigismund in 1433. His son LUIS, "the Turk" (1144–78), owned one of the finest bodies of mercenaries in Europe. His grandson FEDERICO (1500–40) was made Duke by Charles V., and received Montferrat from him. Several of his successors were cardinals. FERDINANDO CARLO (1652–1708) was put to the ban of the

empire and deprived of his duchies for favouring the French cause in the Spanish Succession War. Two Counts and five Dukes of Guastalla also belong to a collateral branch of this family. The last of them died in 1746. Like most Italian princes, the Gonzagas were munificent patrons of literature and the arts, besides being vigorous and unscrupulous warriors.

Gonzaga, LUIGI, Marquis of Castiglione. [ST. ALOYSIUS.]

Goodall, FREDERICK, a well-known English painter, was born in London in the year 1822, his father being an engraver. He exhibited when only seventeen at the Royal Academy. In 1847 his *Village Holiday*, now in the National Gallery, was seen, and was followed in 1851 by *Raising the Maypole*. Two years later he was elected A.R.A., and in 1855 and the following year he exhibited two historical paintings of merit. He went to Egypt in 1857, and henceforth most of his subjects were Oriental. He became R.A. in 1863.

Good Conduct Pay, extra pay allowed to soldiers in the British army below the rank of non-commissioned officers. A soldier who after two years' service has committed no crime or breach of discipline sufficiently serious to be entered in the regimental defaulters' book is entitled to 1d. a day. After 6 years' service he receives another 1d., if his name has not been entered for two consecutive years. Twelve years' service under the same conditions entitle him to a third 1d., eighteen to a fourth, and each additional 5 to another 1d. There is a badge, corresponding to each of these payments, which is worn on the left sleeve. A soldier whose name is not entered during 14 years henceforward receives his good conduct pay two years before the usual time. An entry in the regimental defaulters' book involves the loss of one badge and the pay accompanying it, but these may be recovered under certain conditions. But a soldier on whom a severe sentence is passed, whether by a court martial or a civil court, thereby forfeits all his badges and good conduct pay. The good conduct pay awarded in the navy never exceeds 3d. a day, and may be held by petty officers.

Goodenough, JAMES GRAHAM, naval officer, born about 1830, became a lieutenant in 1851, a commander in 1858, and a captain in 1863, and after greatly distinguishing himself in many ways in the fields both of war and peace was appointed commodore on the Australian station, with his broad pennant in the *Pearl*. Here he was attacked with poisoned arrows by the natives of Santa Cruz island, and, being wounded in two places, died from tetanus nine days later, on August 21st, 1875. A gold medal bearing his name is now given to the sub-lieutenant who passes the best examination of his year in January, and who has also taken a first class in seamanship.

Good Friday, the Friday before Easter, is the day on which our Lord's crucifixion is commemorated. Together with Easter Day it took the place of the Jewish Passover under the new dispensation, and was named *Pascha Staurosimen*.

(Greek, "the paschal day of the crucifixion") by the early Church, who observed it as a day of fasting and prayer. In the Roman Catholic Church none but sick persons and the priest who ministers to them are allowed to partake of the sacrament. The priests and acolytes are clothed in black, the altar remains bare as on the preceding day, and special prayers are offered up for all orders in the Church, as well as heretics, Jews, and pagans. In the Anglican Church proper psalms and special collects, including a prayer for all Jews, Turks, infidels, and heretics, are ordained for Good Friday. In England and Ireland public business is suspended in accordance with legal regulations, but this practice does not extend to Scotland or the United States.

Goodrich, SAMUEL GRISWOLD (1793-1860), an American writer, best known by his pen-name, "Peter Parley," was born at Ridgefield, Connecticut. His most popular works were children's books, of which he published a great number. Hawthorne's *Twice-Told Tales* appeared in a Boston annual edited by him. Goodrich's *Recollections of a Lifetime* appeared in 1857.

Good Templars, a temperance society established in the United States in 1852, and in England in 1868. The organisation resembles that of the Freemasons, with lodges, pass-words, etc.

Goodwill, the benefit which accrues to a business which has been carried on for some time in a particular place either by one person or by a firm, or from the use of a special trade mark or trade name. Its value is coextensive with the probability that old customers will continue to be customers notwithstanding a change in proprietors or in its place of business. An assignment of a goodwill implies a recommendation of the assignee by the assignor to his connection, and an agreement by him to abstain for the future from all competition in the business. A goodwill is considered a subject of sale along with the stock and business premises. In taking an assignment of a goodwill it is usual for the assignee to have a general covenant from the assignor not to carry on business within a certain distance from the premises.

Goodwin Sands, a famous shoal lying some five miles off the coast of Kent between Sandwich and Deal. It is 10 miles long, and from $1\frac{1}{2}$ to 3 miles in breadth. It was once an island, and formed part of the estate of Earl Godwine. From his son it was taken and given to St. Augustine's Abbey at Canterbury; and the story goes that the abbot of this house, instead of keeping the sea-wall in proper condition, spent the money which should have gone towards it on the building of Tenterden steeple. So when in 1099 the island was submerged by the waves, it was said that "Tenterden steeple was the cause of the Goodwin Sands." This tale is not, however, consistent with the facts of science. The Sands act as a breakwater to the waves of the Downs. Great part of them is sometimes dry for hours, and quite firm; but when covered by the sea they shift. Many ships have been lost on them, and elaborate precautions are

now taken to warn vessels. Four lightships, each painted red, the lights of which can be seen at a distance of 10 miles, are stationed round the shoal, and there are also nine buoys of various colours and shapes moored around. Gongs are sounded during a fog, and warning guns are fired at all times. Attempts have also been made to set up a lighthouse, but without any permanent success. Ships actually wrecked are succoured by life-boats from Ramsgate, Deal, Walmer, and Kingsdown, aided by small boats called "Hovellers' boats." Among the many catastrophes connected with the Goodwin Sands may be mentioned the following:—On the night of November 26, 1703, no less than thirteen men-of-war were lost during what is known as "the great storm," and an admiral and 1,200 men perished, only about 200 being rescued by the great exertions of the mayor of Deal. In 1805 the *Aurora* and 300 persons were submerged, and in 1814 the *British Queen*, with all hands, went under. The last great loss on these sandbanks was that of the mail-steamer *Violet* in January, 1857.

Goodwood, the seat of the Duke of Richmond, 3 miles N.E. of Chichester, Sussex, is notable for its collection of portraits and its famous park. A mile to the N.E. of the house is Goodwood race-course, where horse-races have taken place in every July since 1802.

Goodyear, CHARLES (1800-60), the inventor of vulcanised indiarubber, was born at New Haven, Connecticut, and died in New York. He began life as an iron-manufacturer, but about 1834 began to devote his attention to the making of indiarubber. He took out his first patent in 1844, and after a long struggle and much litigation succeeded in further perfecting his invention. He took out in all 60 patents, and his material was applied to nearly 500 different uses.

Googe, BARNABE (1540-94), an Elizabethan poet, was a native of Lincolnshire. He was a *protégé* of Cecil, Lord Burghley, through whose influence he obtained an office at Court and employment in Ireland. His *Eglogs*, *Epytaphes*, and *Sonnetes* were published in 1563; they are included in Arber's *English Reprints*. He was much esteemed by his contemporaries.

Goosander (*Mergus merganser*), a bird of the Duck family from Arctic and North Temperate regions, visiting Britain in the winter, some few breeding in Highland lochs. The adult male is a little over two feet long; the head and upper part of the neck are deep glossy green, forming a crest-like tuft at the crown; the back is black, fading into grey; the wings are black mixed with white, and the under is a warm buff. The female is a little smaller, with duller plumage. These birds live on fish, which they take by diving and hold easily in the serrated bill, the teeth-like edges of which have given rise in some parts of the country to the popular name of Saw-bills for these birds. [MERGANSER.]

Goose, any bird of the genus *Anser*, of the Duck family (*Anatidae*), ranging over the Palæarctic and Nearctic regions to Central America and the

Antilles. The body is compact, and the legs are set nearly in the centre, so that these birds can walk fairly well on land; the neck is short, and the head large; the upper mandible is vaulted and terminated by a broad nail, and the lower mandible is flat beneath. The plates at the margins of the bill are modified into tooth-like processes, well adapted for cropping the vegetation which forms the principal food of these birds. There are three toes in front, all united by a membrane; the hinder toe is free. On the wrist joint (that is, at the bend of the wing) is a hard knob, which in the Spur-winged Goose (*Plectropterus gambensis*), from Central and South Africa, is developed into a spur. Geese are far less aquatic than ducks, and though they swim well they rarely dive, and great part of their life is spent on dry land. The Common Goose was domesticated at a very early period, and has run into many varieties, of which the Toulouse Geese are the largest. The plumage of the adult bird is white; newly-hatched goslings are covered with greyish down, and the young birds retain some dark patches. Economically the goose is of great importance for the table, for its soft feathers, and, to a less degree than formerly, for its quills, which are still made into pens, and which, like the feathers, are plucked from the living birds. Large herds of geese are kept in Lincolnshire, Norfolk, and Suffolk to supply the London markets. The famous Strasburg *pâtés* are made from goose-livers abnormally enlarged by keeping the birds without water in a place where the temperature is very high. Four species of wild geese are British visitors, but of these only one—the Grey Lag Goose (*A. cinereus*)—stays to breed, though it was common in the Fen country before that district was drained. This bird, from which the domestic goose is probably derived, is about 35 inches long, greyish-brown above, and white with dark markings beneath; the female is smaller. The Laughing or White-fronted Goose (*A. albifrons*), with brown plumage, is much smaller. In these two species the nail at the end of the bill is white, while in the other two—the Bean Goose (*A. segetum*) and the Pink-footed Goose (*A. braehyrhynchus*)—it is black. [BARNACLE GOOSE, BRENT GOOSE, CEREOPSIS, DUCK, SWAN.]

Gooseberry (*Ribes grossulariæ*), a well-known fruit-bearing shrub, native to Nepaul, Western Asia, North Africa, the mountains of Crete, Central and Northern Europe, as far north as lat. 63°, in Norway, and in the North of England. The name “gooseberry” and the French *groseille* are probably derived from the German *krausbeere*, whilst the provincial name, “feaberry,” indicates the value formerly attached to its cool acid fruit in cases of fever. The plant differs from the allied species of *Ribes*, the currants, in its spinous stems and in its flowers being produced singly or two or three together, and not in a raceme. It has long been cultivated, and many hundred sorts have been raised, with fruit either hairy, downy, or smooth (*var. Tra-erispa*), round or oval, green, yellow, or red. The acidity of the green fruit is due mainly to malic acid. It is largely used for tarts. When ripe the fruit contains from 6 to 8 per cent. of sugar,

and is used for dessert and jam. The shrub suffers much from attacks of insects, especially the larvæ of the beautiful magpie moth (*Abraxas grossulariata*) and that of the V-moth (*Halictus ranaria*).

Goose-fish, a local American name for the Angler (q.v.).

Goosefoot, the popular name for the wild species of the genus *Chenopodium*, weedy plants with generally triangular leaves, sometimes mealy, minute flowers with five perianth-leaves, five stamens, and two styles; and a single seed with copious floury albumen, in a one-chambered ovary. The genus, which comprises about fifty widely-distributed species, is the type of the cœpetalous order *Chenopodiaceæ*.

Gooseneck, a name applied in the metallurgy of iron to the pipe conveying the *blast* from the main pipe to the twyers by which it is delivered into the blast furnace, where the iron is being smelted.

Gopher, a loose name for several American burrowing animals, among others the prairie-dog, the chipmunk, and *Testudo carolina*, a tortoise from the southern states.

Gorakhpur, a district and city in the North-West Provinces of British India. The former has an area of 4,578 square miles, being bounded N. by Nepaul, S. by the river Gogra, E. by Champaran and Saran, and W. by Fyzabad and Barti. It consists for the most part of a wide alluvial plain stretching up to the feet of the Himalayas, and broken by a few sandhills and many dense forests. Rivers, lakes and marshes abound, among the former being the Rapti, the Gogra, both Gandaks, the Kuana, and others. The population, chiefly Hindu, shows a tendency to increase. Cotton, timber, rice, and other grains form the chief produce. Gautama Buddha, the founder of the Buddhist cult, died in this region, which thus became the cradle of the new faith. The British occupation dates from 1801. The city of Gorakhpur was founded about 1400 on the Rapti, and is the administrative centre of the district, possessing a considerable trade in timber and food-stuffs.

Gorales, Polish communities of the Berkid Mountains (Western Carpathians), Galicia, who, despite the almost troglodyte existence which they lead in these remote uplands, have the reputation of being physically the finest, and morally the most intelligent, of all the Galician populations. Like their Slovak neighbours, they leave their villages periodically in search of employment in Poland, Germany, and Hungary, never failing to return with their earnings to their mountain homes. They also act as guides to wayfarers across their almost trackless forests, and are much addicted to the contraband trade carried on across the political frontiers. The national name means “Highlanders,” from the Slavonic word *gora*, a mountain.

Gorchâni, one of the main branches of the Baloch nation, chiefly in the Jampûr division of the Dera Ghazi Khan district on the Afghân frontier. There are a large number of septs grouped under

twelve or thirteen separate divisions, of which the most important are the Shikâni, Hotwâni, Khalilâni, Jaskâni, Pitafi, Lishâri, and Durkâni, comprising altogether 2,600 fighting men, and 23,000 souls. The Gorchâni are not of pure Baloch stock, and are even regarded by some ethnologists as of Jât origin. Their historic traditions go back to the eighth century, when they were settled in Sindh, and after their enforced conversion to Islâm removed by the Arab conquerors to the northern parts of Saravân. In the eighteenth century they migrated towards the Indus, where they wrested their present territory from the Afghâns. With the British conquest of Punjâb they passed under English rule, and are at present chiefly grouped round the frontier fortress of Harrand in the upland valleys of the Soleimân Range. (Macgregor, *Gazetteer*; Bruce, Major Minchin.)

Gordiacea, a division of the Nematode worms which have been ranked by Vejdovsky as a distinct class, the "Nematomorpha," as they differ greatly from the normal Nematode in their nervous, digestive, and generative systems. [NEMATODA.]

Gordian Knot. Gordius was a Phrygian peasant, who became king of the Phrygians in consequence of a response of the Delphic oracle, telling them to choose the first man whom they saw riding in a cart to the temple of Zeus. After his election Gordius consecrated his cart and yoke to Zeus, and placed them in the citadel of Gordium, a name given in honour of himself. The yoke was tied with a knot so intricate that an oracle announced that he who unloosed it would become ruler over Asia. The prophecy was fulfilled by Alexander the Great, who severed it with his sword.

Gordianus, or GORDIAN, a name borne by three Roman emperors. MARCUS ANTONIUS AFRICANUS GORDIANUS assumed the purple in 238 jointly with his son, being at that time pro-consul in Africa. They were, however, speedily overthrown by Capellianus, who represented the deposed Emperor Maximin in Mauretania. The Senate then called Maximus and Balbinus to share the throne, and with them MARCUS ANTONIUS GORDIANUS PIUS, a mere boy, was associated in the imperial dignity. His two colleagues being killed in a revolt of the Prætorian Guards, the young Gordianus reigned alone, under the tutelage of his father-in-law, Misitheus. On the death of the latter, probably through poison administered by his rival Philip, the emperor then marching to quell an insurrection in Persia was murdered by his soldiers (244 A.D.) on the banks of the Euphrates.

Gordon, ALEXANDER, the author of the *Itinerarium Septentrionale* and immortalised as "Sandy Gordon" in Scott's *Antiquary*, was probably born and educated at Aberdeen about 1700. Little is known of his early life, but he seems to have travelled as a tutor, and in 1726 he reappeared in Scotland and published his great work. He held successively the secretaryship of the Society for the Encouragement of Learning, the Society of Antiquaries, and the Egyptian Club. In 1741 he

settled in South Carolina, and became registrar of the province. The date of his death is uncertain, but his will was made in 1754.

Gordon, CHARLES GEORGE, GENERAL, was born in 1833, and received a commission in the Royal Engineers at the age of nineteen. In 1855 he was sent out to the Crimea, and took part in the siege of Kinburn and the destruction of Sebastopol. He joined in 1860 the allied forces in China, being present at the capture of Peking and aiding in the building of the Taku forts. The outbreak of the Tai-ping insurrection afforded him an opportunity for distinguishing himself by suppressing the rebels in the Shanghai district, and he was appointed to the command of the disorganised Chinese army, and in little more than a year the revolt was crushed. In 1874, at the invitation of the Khedive, he undertook the control of the Soudan with a view to the extirpation of the slave-trade. He resigned in 1876, but was reinstated in 1877 with fuller powers as Governor of the Soudan and the Equatorial Provinces. In 1884 he was entrusted with the dangerous and difficult duty of the pacification of the Soudan, a task for which he felt himself to be specially qualified. Too confident, perhaps, in the prestige of his name, he hurried on single-handed to Khartoum, the stronghold of Mahdism. There he maintained himself amidst a wretched and untrustworthy garrison against a siege of 337 days. A relief expedition was sent out with Lord Wolseley in command, but on January 26, 1885, a few days before the advanced guard of the British force were in sight, Khartoum fell into the hands of the fanatics, and Gordon, who scorned to save himself by flight, was killed among the foremost.

Gordon, LORD GEORGE, third son of the Duke of Gordon, was born in London in 1751. He left Eton to enter the navy, but soon resigned his commission and was returned to Parliament for Luggershall in 1774. A fluent speaker and a man of eccentric but honest views, he attached himself to no party, until his violent opposition to the removal of Roman Catholic disabilities placed him, in 1780, at the head of the turbulent Anti-Papal leagues. In this capacity he led a mob to Westminster for the purpose of presenting a monster petition against the Toleration Act, and the riots ensued with which his name is associated. Many Catholic chapels, private houses, and prisons were broken into and set on fire, the Bank of England was attacked, and 450 lives were lost before quiet could be restored. He was arrested and brought to trial, but escaped conviction owing to the skilful management of his defence by Erskine. In 1787 he was convicted of libels against the Queen of France and other persons, but he fled to Holland. Returning in 1788, he was sentenced to five years' imprisonment, and died in Newgate a few months after the expiration of that period, as he refused to give securities for good behaviour on his release. Before his death he embraced Judaism.

Gordon, SIR JOHN WATSON, P.R.S.A., whose family name was Watson, was born in Edinburgh in 1788, and destined for the Royal Engineers.

His first picture, inspired by *The Lay of the Last Minstrel*, was exhibited in 1808, but he soon abandoned *genre*-painting for portraiture. On the death of Raeburn in 1823 he succeeded to his practice, and assumed the name of Gordon. Among his most distinguished sitters may be mentioned Sir Walter Scott, Sir Archibald Alison, Dr. Chalmers, J. G. Lockhart, Professor Wilson, De Quincey, Sir David Brewster, Lord Dalhousie, Lord Macaulay, Lord Cockburn, Sir John Shaw-Lefevre, and the Prince of Wales. Though monotonous as a colourist, he threw much dignity and character into his portraits. He received the distinction of knighthood and the appointment of Limner to Her Majesty in 1850, and was elected a Royal Academician in the following year, dying in 1864.

Gordon, LUCIE, LADY DUFF, the only child of John Austin, the jurist, and of his gifted wife, was born in 1821. As a child she accompanied her parents abroad, and thus became a finished French and German scholar, and a friend of Heine. At the age of eighteen she published a translation of Niebuhr's *Greek Legends*, and in 1840 married Sir Alexander Duff Gordon. Inheriting her father's delicate constitution, she was obliged to take a sea voyage, which led to the publication in 1862-64 of her charming *Letters from the Cape*. Still more delightful are her *Letters from Egypt*, which appeared in 1865. She died at Cairo in 1869. Among her other works, chiefly translations, are *The Amber Witch*, *The French in Algiers*, *The House of Brandenburg*, *Remarkable Criminal Trials*, and *Sketches of German Life*, in the last of which her husband took a share.

Gordon, GENERAL PATRICK, born in Aberdeenshire in 1635 and connected with the Earls of Aberdeen, was sent to Prussia to complete his education. Having run away from college, he enlisted in the Swedish service, and from 1655 to 1661 fought alternately on the side of the Swedes and their enemies the Poles. He then joined the Russian army, and in 1666 was sent by the Tsar Alexis on a mission to England. He rose rapidly through his zeal and abilities displayed in campaigns against Turks and Tartars, and was promoted by Peter the Great to the command of the forces by which the Tsarina Sophia was defeated, and ultimately to the command-in-chief of the empire. He died in 1699, leaving an interesting diary, portions of which have been recently published.

Gore, MRS. CATHERINE GRACE, the daughter of a Mr. Moody, was born at East Retford, Notts, in 1799, and in 1823 married Captain Charles Gore. Her first novel, *Theresa Marchmont*, appeared in that year, and before 1832 she had published *The Reign of Terror*, *The Lettre de Cachet*, *Hungarian Tales*, *Manners of the Day*, *Mother and Daughter*, and *The Fair of Mayfair*. Then there was an interval of non-production during which she travelled, her next venture being *Mrs. Armitage* in 1839. *Cecil; or the Adventures of a Coxcomb*, *Greville*, *Fascination*, and *The Banker's Wife* are the best-known amongst the many clever but superficial

sketches of society which she continued to throw off until her death in 1861.

Gore, SIR JOHN, British naval officer, was born at Kilkenny in 1772, entered the navy in 1780, and served in the attempted relief of Cornwallis at Yorktown, and in Rodney's actions in 1782. In 1794 he distinguished himself ashore at Toulon, and subsequently in Corsica, where he was under Nelson's orders. In that year he was posted, and in 1795, having taken part in her capture, was appointed to the *Censeur*, 74. In her he was taken by a squadron under Admiral Richéry, after a most brilliant defence. He was soon exchanged, and was afterwards employed in the *Medusa*, Nelson's flag-ship, in the operations against the Invasion Flotilla. Later he assisted in the capture of three valuable Spanish treasure-ships, and for this exploit he was knighted. He served almost continuously, and was many times in action, until his promotion to flag-rank in 1814, whereupon he assumed command in the Adriatic and the Levant, and took possession of Corfu. He was commander-in-chief in the Medway from 1818 to 1821, and, after doing other services, died a vice-admiral in 1836.

Görgei, or GOERGEY, ARTHUR, a Hungarian general, who was born at Toporecz in 1818, and entered the cavalry at the age of 18, but retired in 1845 to devote himself to study and the management of his estates. The revolutionary movement of 1848 caused him to resume the sword, and he was entrusted by the Hungarian Government with an important command. Count Eugene Zichy was tried and executed by his orders for treason. He forced Roth to a capitulation, and, though defeated at Schwechat, was appointed by Kossuth to the chief command. In 1849 he declared himself against separation from Austria, and was for a time superseded by Dembinski. Being restored to power he achieved considerable successes at Nagysarlo, Komorn and Buda, but was forced to retreat by Haynau. In August, 1849, he was appointed dictator, and, finding his position desperate in face of the Russian army and the intrigues of Kossuth's party, he surrendered at Világos, received a pardon, and retired to Klagenfurt, where he wrote an elaborate defence of his conduct (1852), and was subsequently employed as a railway engineer.

Gorgias, a Greek philosopher, one of the early "Sophists" or teachers of rhetoric, was born at Leontini in Sicily early in the 5th century B.C., and died at Larissa in Thessaly about 375 B.C. Little is known of him save that Plato associated his name with one of the most finished of his dialogues, and that he was the author of a work *On the Non-existent, or Nature*.

Gorgon, or GORGO, a mythical conception of the early Greeks, in which may perhaps be traced an impersonation of the thunderstorm. According to Hesiod there were three Gorgons, but Medusa is the only one of importance. From her Poseidon begot Chrysaor and Pegasus (lightning and thunder?) who sprang out of the monster's blood, when Perseus, the light-bearing hero, cut off her head

and placed it on Athene's shield to turn to stone all who gazed on it. The hideous mask was gradually transformed by art into a beautiful though awesome face of death. Attic legends connect the idea with the war between Zeus and the Titans.

Gorgonia is the best-known genus of the Axifera (q.v.), a group of the Alcyonaria (q.v.), or corals, with an eight-rayed symmetry. Its most familiar ally is *Corallium*, the "red coral" of commerce, from which it mainly differs by the facts that the corallium is formed from the external layer or ectoderm by means of an ingrowth (invagination) around the base; in *Corallium* the skeleton is formed by the "mesogloea" (q.v.) or the middle layer of tissues. The colony is fixed and branched. There is no "polymorphism" (q.v.), all the individual polypites being built on the same plan. In addition to the central axial skeleton, there are numerous spicules scattered through the external tissues. They are all marine. Spicules referred to the allied genus *Gorgonella* have been described from the Miocene, while some, probably belonging to *Gorgonia*, occur in Tertiary rocks in Trinidad.

Gorham, GEORGE CORNELIUS, was born in 1787, and graduated at Queen's College, Cambridge, where he became fellow and tutor. He wrote in early life several tractates on *Public Worship*, on the impropriety of mixing the apocryphal books with the canonical Scriptures, etc., and in 1848 he was presented to the living of Brampton-Speke, Devon. The Bishop of Exeter (Dr. Phillpotts) refused to institute him on the ground that he denied the doctrine of baptismal regeneration. Mr. Gorham appealed to the Privy Council, and a decision was given to the effect that his views did not justify exclusion from his benefice. The bishop declined to obey, and after two further suits Mr. Gorham was instituted by the Archbishop of Canterbury. He died in 1857.

Gorilla (*Anthropopithecus gorilla*), the largest of the Anthropoid apes, of the same genus as the Chimpanzee (q.v.). It is a native of Western Equatorial Africa, and, though mentioned by Hanno the Carthaginian (B.C. 470), only became known to science in 1847, when a skull was sent to Boston by an American missionary on the Gaboon river. Some years later Du Chaillu visited Western Africa (1855-59), and from him the first trustworthy accounts of the animal were obtained. Gorillas go about in families, and, though good climbers, live principally on the ground and travel on all fours, rarely assuming an erect posture. They subsist chiefly on fruit, occasionally taking eggs, birds, and probably small mammals. An adult male when erect is about 5 ft. 6 in. high, the skin is black and covered with long hair, very thick on the back, and varying in colour from dusky red to dull black. The skull is figured under ANTHROPOID APES (q.v.), and should be compared, especially as to the development of the canines and its bony crests, with that of man (Fig. 1). The brain is of a low type and much less convoluted than that of the orang or the chimpanzee. The ferocity of the

gorilla has probably been exaggerated, but its great strength renders it, if attacked, a formidable antagonist.

Görlitz, the capital of a circle in the district of Liegnitz, Prussian Silesia, stands on the left bank of the Neisse, 55 miles from Dresden on the railway to Breslau. It existed as the village of Drebenau until 1131, when it was burned down and rebuilt under its present name. As a strong fortress it played a considerable part in history, suffered much during the Thirty Years' and the Seven Years' Wars, and was the scene of a famous battle in 1757 between the Austrians and Prussians. More recently it has become a great commercial centre, and the population has increased six-fold in sixty years. The city is well-built and handsome, with two good fifteenth-century churches, fine modern buildings, including a school of commerce, a public park, and pleasant promenades. Cloth is the staple manufacture, but railway waggons and machinery, chemicals, linen fabrics, and leather are also produced.

Görres, JOSEPH JOHANN, was born at Coblenz in 1776 of a Catholic family. As a boy he picked up the revolutionary ideas then current, and he gave expression to them in a journal entitled *Rübezahl*. Taking up strongly the grievances of his fellow-countrymen under French rule in the Rhine Provinces, he went in 1799 on a deputation to Napoleon. In 1814 he brought out the *Rheinischer Merkur*, which soon became the organ of German unity, and received the support of Stein, Varnhagen von Ense, the Grimms, Gentz, and other politicians. His Liberalism and his anti-Prussian feeling led to the suppression of the publication in 1816, and to his own expulsion from his educational office. He then became a violent partisan writer, and his pamphlet *Deutschland und die Revolution* provoked such animosity that he had to escape into Switzerland. Ultramontanism was his next phase, and he thus won the protection of Ludwig of Bavaria, who invited him to Munich. Here he produced *Athanasius*, a powerful assertion of the supremacy of the Church, and he edited a journal supporting clericalism. His death took place in 1848.

Gorse. [FURZE.]

Gortschakoff, PETER, born 1790, served in the campaigns of 1812-13-14, suppressed an insurrection in the Caucasus (1820), took part in the Turkish War of 1828-29, and from 1839 to 1852 was engaged in the administration of Eastern Siberia, where he effected great reforms. He offered his services, though broken in health, at the outbreak of the Crimean War, took command of the 6th Army Corps, and led the left wing both at Alma and Inkermann. Retiring finally in 1855, he died at Moscow in 1868. GORTSCHAKOFF, MICHAEL, born in 1792, passed through the same military experiences in early life as his brother. In 1830 he was sent into Poland as general of artillery, received a wound at Grochow, assisted in the capture of Warsaw, and ultimately became military governor of the province (1846). He was employed in suppressing the Hungarian patriots in 1849, and in 1852 came to London

on the occasion of Wellington's funeral. In 1853, on the resumption of hostilities between Russia and Turkey, he entered the Principalities as commander-in-chief, and proceeded to besiege Silistria. Next year he assumed the direction of affairs in the Crimea in place of Prince Mentschikoff, and displayed much skill in the defence of Sebastopol. In 1856 he returned to Warsaw, and died there in 1861. GORTSCHAKOFF, ALEXANDER, the younger brother, was born in 1800, and entered the diplomatic service whilst very young. At the age of 24 he was secretary of the Russian Legation in London. He was next transferred to Florence, and thence went to Vienna. At Würtemberg he negotiated the marriage between the late king and the Grand Duchess Olga. The year 1850 found him representing Russia at the German Diet, and in 1854, as ambassador extraordinary, he undertook at Vienna the negotiations for peace, returning to take the portfolio of Foreign Affairs. For twelve years Gortschakoff held a position in European politics scarcely inferior to that which Bismarck was destined to fill, but as internal troubles forced themselves more and more on the attention of the 'Tsar the influence' of the diplomatist declined. In 1882 he resigned, and he died at Baden-Baden in the following spring.

Görz, a district occupying an area of about 1,146 square miles at the head of the Adriatic between Carinthia to the N., Trieste to the S.E., and Italy to the W., and forming with Gradisca one of the Austrian crown-lands. Limestone rocks violently distorted, subterranean rivers, amongst them being the classical Timavus, and vast forests are the chief physical characteristics of this rugged tract. The vine grows well in the stony soil, and wheat, maize, potatoes, and silk are produced in the alluvial valleys. During the dark ages Görz was an independent principality or county under the Empire, but in 1500 it lapsed to the House of Hapsburg. The population is mainly Slovenian and Catholic.

Goschen, THE RIGHT HON. GEORGE JOACHIM, M.P., was born in 1831. He passed from Rugby to Oriel College, Oxford, where he took a first class in classics in 1858. In 1863 he was returned as a Liberal for the City of London, and gave strong support to the movement for abolishing religious tests in the universities. In 1865 he joined Lord John Russell's Ministry as Vice-President of the Board of Education, being transferred next year to the Chancellorship of the Duchy of Lancaster with a seat in the Cabinet. In 1868 he returned to power with Mr. Gladstone, holding office until 1874 first as President of the Poor Law Board, next as First Lord of the Admiralty. He proceeded to Egypt in 1876 as representative of the British bondholders, and assisted in drawing up the agreement for reorganising the finances of that country. This mission was followed up by a visit to Constantinople in 1880, under Mr. Gladstone's auspices, as Ambassador Extraordinary, and he obtained from Turkey partial recognition of the claims of Greece under the Berlin Treaty. Meanwhile he had resigned his seat for the City of London, and had been elected M.P. for Ripon. He now began to

show marked dislike to the tendencies of his party. His vote was given against Mr. Gladstone's Egyptian policy, and he joined in opposing the extension of the franchise in 1884. He was returned in 1885 for East Edinburgh against a Liberal candidate, but in 1886, having openly thrown off his allegiance to Mr. Gladstone, he lost his seat and found a more congenial constituency in St. George's, Hanover Square. Before the year was over he accepted the Chancellorship of the Exchequer in Lord Salisbury's Ministry. His measure for reducing the interest on the National Debt was ably worked out and skillfully carried through. In 1890 Mr. Goschen was chosen Lord Rector of the University of Edinburgh. Apart from the publication of speeches and addresses, he has written a valuable treatise on *The Theory of Foreign Exchanges* (1863).

Goshawk (*Astur*), a genus of Falconidæ, with 30 species universally distributed, except in some parts of South America, and differing from the true Falcons by having the bill without a notch. The Common Goshawk (*A. palumbarius*), formerly bred in Britain, but is now a rare visitor. The female, about two feet in length, is a little larger than her mate, and was used in falconry (q.v.), and in Asia goshawks are still employed to kill ground game. The plumage in both sexes is slaty blue above, with dark bars on the wings and tail; the under-surface is whitish with dark cross-bars.

Goshen, or THE LAND OF GOSHEN, the district occupied by the Israelites during their sojourn in Egypt, was probably situated in the most eastern part of Lower Egypt, and the classical Phacusa (Pa-Kesem) has been identified as its capital. Gesem is the form in which the word occurs in the Septuagint. Fakoos (Phacusa) still is a pastoral country 20 miles S. of Lake Sâh, near which was the site of Tanis-Rameses, the ancient administrative centre and the point from which the Exodus probably started. (See Gen. xlvii. 11.) Another "Land of Goshen" existed in S. Palestine.

Goslar, an ancient walled town founded by Henry the Fowler (920 A.D.) on the river Gose at the foot of the Harz Mountains in Hanover, about 24 miles S.E. of Hildesheim. It owes its origin and prosperity to the neighbouring mines of sulphur, copper, silver, etc. There are many interesting old buildings, including a chapel of Henry III.'s cathedral (1040) with an altar supposed to be that of the idol Krodo, the Kaiserwerth, the Kaiserhaus, the monastery of Neuwerk, and the house in which Maurice of Saxony was born. It became part of Prussia in 1866.

Gospels. The word *gospel* is the Anglo-Saxon *godspell*, the "story of (the life of) God" (i.e. Christ), or "good-spell," the equivalent of the Greek *euangelion*. The four Gospels were written during the latter half of the 1st century—those of Matthew, Mark, and Luke before the destruction of Jerusalem, and that of John towards the end of the century. A comparison of the four Gospels exhibits a broad difference between that of St. John and the three others. Matthew, Mark, and Luke give full accounts of our Lord's visits to Galilee, and as the

view of His life presented by the three narratives is essentially the same, while the details recorded are sometimes different, they have been termed the *Synoptic Gospels*. If we did not possess the fourth Gospel we should not know that He kept the great festivals at Jerusalem. St. John, on the other hand, passes rapidly over His life in Galilee, recording only two incidents in His ministry there which are found in the other Gospels, but gives a full account of His teaching at Jerusalem. The reason probably is that, coming after the other evangelists, he thought it unnecessary to repeat what was already well known, especially as his book seems to have had a doctrinal rather than an historical aim. The general similarity of the Synoptic Gospels is very striking. The very words used are often either exactly or very nearly the same. This occurs most frequently when the words of another are reported, but in some of the most important narrative passages—as, for example, in that describing the Transfiguration—the verbal coincidence is very remarkable. To explain this agreement in form and matter, various suppositions have been put forward, which impugn the authenticity of all or most of the narratives. Grotius, Mill, and others suggested that the first evangelist had been copied by the second, and both the first and the second by the third, and tried to find out which was the original Gospel. The notion of Eichhorn that they were all based on a certain common document does not at first sight seem so absurd; but in order to demonstrate his theory he found it necessary to assume four copies of this document, each of which was used by one or more of the evangelists. Bishop Marsh found that Eichhorn's theory could be maintained only by raising the number of documents to eight. There is no shadow of evidence that any such documents ever existed, and, assuming their existence, it is very remarkable they should all have disappeared. A more reasonable explanation has been put forward by Giessler and others. It is pointed out that as, in the course of their missionary labours, the apostles and the teachers appointed by them would often be called upon to repeat the same historical facts, a fixed form of narrative would gradually grow up, which would sooner or later be transmitted to writing. This would apply especially to the leading events in our Lord's life, such as the baptism and the crucifixion, with the events immediately preceding it, and it is just here that the verbal agreement is the most remarkable. The accounts of the resurrection, on the other hand, differ considerably both in their wording and in the details mentioned—a fact which may be explained by supposing that, as its truth was denied by the Jews (Matthew xxviii. 13–15), each evangelist would feel himself urged to bring forward new evidence in its support.

The theories of modern German critics concerning the composition of the Gospels are too numerous and conflicting to be dealt with in detail here. Many of them put the Gospels much later than the writers whose names they bear, and regard them as coloured by the views of one or other of the two schools—the Judaisers and the Pauline school—distinguished in Acts xv. and Galatians ii.

Of the fourth Gospel in particular the genuineness has been much attacked by Baur and the Tübingen school. But a reaction from the extremes of this school, especially in the last point, has been visible of late years.

The earliest versions of the Gospels now known to us are in Hellenistic Greek—*i.e.* a somewhat debased form of Greek spoken by the Eastern nations who had come under the influence of Greek civilisation. In the case of Mark, Luke, and John there can be no doubt that this was the original form, but it is stated by Papias, Irenæus, and other Fathers that St. Matthew's Gospel was first written in Hebrew—*i.e.* in Aramaic, the dialect then spoken by the Jews. As Matthew's Gospel was primarily addressed to the Jews, so those of Mark and Luke were intended in the first instance for the Gentiles. An ancient tradition of the Church asserts that St. Mark's Gospel was written under the direction or influence of St. Peter, and this account is borne out by internal evidence.

Gosport, said to have received its name, "God's Port," from the Bishop of Blois, who found refuge here from a storm in 1158, is a fortified port on the W. side of Portsmouth harbour. The works, recently renewed, extend from the Solent to the head of the harbour, and enclose barrack accommodation for at least 5,000 men, powder magazines, the Haslar Naval Hospital, the Clarence Victualling Yard, and other establishments. There are also private sheds for building yachts, and a considerable coasting trade exists. A floating bridge connects the town with Portsmouth about a mile distant.

Gossamer, a thin film, consisting of innumerable threads, which covers the ground or floats in the air on fine days towards the end of autumn. The separate threads are so slight that they are visible only when they catch the sunlight. Gossamer, when it is bathed in sunshine, has a beautiful sheeny effect, which is enhanced by the sparkling beads of dew that become caught in the tissue. The origin of gossamer long remained obscure. In the 17th century Dr. Hulse and Dr. Martin Lister announced that they had discovered it to be the work of spiders, but this theory did not obtain general recognition till a much later period. It is now known that it is produced by small spiders, which probably belong to several different species. No satisfactory explanation has hitherto been given as to the purpose which gossamer is meant to serve. As the spiders which produce the floating gossamer are wafted upwards with it as soon as it is formed, it has been thought by some that their object in producing it is to catch their prey in the air.

Gosse, PHILIP HENRY (1810–1888), English naturalist, began life in commerce and visited Newfoundland, Canada, and the United States. His early fondness for science was strengthened by this experience, and in 1840 he published his *Canadian Naturalist*. In 1847 he wrote *The Birds of Jamaica*, followed by *A Naturalist's Sojourn in Jamaica*. He next settled in Devonshire, and devoted himself to marine zoology, which his books

on aquaria did much to popularise. In 1850 he was elected F.R.S. Among his better known works are *Manual of Marine Zoology*, *Romance of Natural History*, *A Naturalist's Rambles on the Devonshire Coast*, *History of British Sea Anemones and Corals*. His son, Edmund Gosse, is known as a poet, translator, and critic.

Got, FRANÇOIS JULES EDMOND, was born in 1822, and, after receiving an excellent education, began his dramatic training at the Conservatoire in 1842, making his *début* at the Théâtre Français in 1844. Six years later he was elected a member of that corporation. He has acted as professor at the Conservatoire and as lecturer at the École Normale, and in 1881 he received the Cross of the Legion of Honour, being the first member of his profession to attain that distinction.

Gotha, formerly the capital of an old German duchy of the same name, but now the chief town of Saxe-Coburg-Gotha in the north, as Coburg is in the south, stands on a canal of the river Leina, six miles north of the great Thuringian forest. In Charlemagne's time it was a village, but under the Landgraves of Thuringia grew into a town under the walls of the strong castle of Gummenstein. Passing into the hands of the Electors of Saxony in the Ernestine line, it became merged, on the death of Duke Ernest the Pious, in the duchy of Coburg. Among the public buildings are the Margaret and the Kloster churches, two smaller ducal residences, the legislative chambers, the gymnasium, the observatory, and a school occupying the former abode of Lucas Cranach. A large trade is carried on, but the most famous local industries are sausage-making and publishing, the famous firm of Perthes and Co. taking lead in the latter.

Gotham, TALES OF THE MEN OF, a collection of funny stories in which the inhabitants of Gotham, a village near Nottingham, are held up to ridicule on account of their foolish actions and remarks. The "fools of Gotham" are mentioned in the Towneley miracle plays, written in or before the reign of Henry VI., so that the tales must have existed in some form at that period. The first printed edition, entitled *Merrie Tales of the Mad Men of Gotham, Gathered Together by A.B. of Phisicke Doctour*, was published about 1550. It has been conjectured that A.B. is Andrew Boorde, a popular wit, who may or may not have been the real compiler. The Gothamite tales relate how the villagers tried to hedge in a cuckoo so as to make it "sing" during the whole year, and to drown an eel which had devoured the fish in their pond, besides many other equally notable feats. One of the stories—that of the man who, whilst riding, shifted a sack of meal from his horse's back on to his own shoulders, to make things easier for the animal—occurs in a Latin poem of the 12th century, where a native of Norfolk, instead of a Gothamite, appears as the hero. In fact, it is a characteristic of the popular tales of all countries and periods to attribute exceptional folly to the inhabitants of some particular district. To go no farther than

England, we find the people of Austwick in Yorkshire and those in the neighbourhood of Marlborough Downs in Wiltshire occupying this unenviable position. The close resemblance of such tales in different lands has led some to believe that they must have been transmitted from one to another. Others attribute the similarity to the innate propensities of human nature. The question can hardly be settled till the science of folk-lore has been established on firmer grounds.

Gothenburg, the capital of the "circle" or "lau" of the same name in the south of Sweden, is situated on the Gotha river near its mouth, and is connected with Stockholm by railway and canal. It is the first commercial city in the kingdom, and with its suburbs covers an area of five and a half square miles. The harbour, accommodating vessels of moderate tonnage, is defended by three forts. The export trade consists principally of timber, iron, and grain, the chief imports being cotton, wool, sugar, coffee, etc. On the same level with the harbour stands the business town, intersected by canals, whilst the residences of the citizens are built in picturesque sites on the rocks above. There are many Lutheran churches, the Domkirka or cathedral dating from 1633, but rebuilt. The Town hall, the Kronhus, and the house of Torstenson are interesting structures. An exchange, a museum, several excellent schools, a theatre, horticultural gardens, and a King's Park add to the attractions of the town, which, besides a large carrying trade, supports various industries such as ship-building, match-making, weaving, brewing, and the manufacture of wooden furniture.

Gothenburg System, THE, denotes the peculiar mode of regulating the traffic in alcoholic drinks which was adopted in the above town in 1865. The sole licensee is a limited company, which pays over to the municipal authorities the net profits of the trade after deducting a certain amount for working expenses and interest. A great reduction has been effected in the number of houses and in the convictions for drunkenness. All houses are closed from 6 p.m. on Saturday to 8 a.m. on Monday.

Gothic Architecture, the style of architecture which prevailed in Western Europe during the latter part of the Middle Ages. The term "Gothic," originally applied in contempt by the admirers of classical architecture, has survived the notion of rudeness and savagery which was formerly attached to everything mediæval, and is not likely to be displaced by "Pointed" or other substitutes which have been proposed. Gothic architecture is the highest type of the arcuated as distinguished from the trabeated method of building. [ARCHITECTURE.] After the irruption of the northern barbarians Roman architecture gradually declined, and various "Romanesque" styles, in which the Roman buildings were imitated, grew up in its place. The Romanesque styles of Western Europe were very inferior to the Byzantine (q.v.), but early in the 11th century there was a marked improvement. The increased skill of builders in the

Romanesque styles during the next century and a half led to the discovery of the principles of Gothic architecture. It arose almost simultaneously in England and France, and Early English and French Gothic are so much alike that they may be regarded as varieties of the same style. The general character of Decorated architecture is likewise the same in England, France (though the Hundred Years' War interfered with its development in that country), and Germany. It was only in its third stage, when it had begun to decay, that Gothic architecture followed a different course in England and on the Continent, diverging into the Perpendicular style in the one case and the Flamboyant (q.v.) in the other.

The history of Gothic architecture in England may, therefore, be regarded as typical of its normal development. Here, as elsewhere, it was of two kinds—ecclesiastical and domestic; but all its main characteristics were displayed on a more ample scale in the former than in the latter. Before proceeding to discuss the progress of English ecclesiastical architecture in detail, it may be well to point out the peculiarities of the English cathedral. It must be remembered that the form of the cathedral was determined by that of the Roman basilica (q.v.), which was afterwards modified by the addition of the transept (q.v.), while its upper stages became the clerestory (q.v.) and the triforium (q.v.). The English cathedrals became more strictly cruciform, owing to the rejection of the apse and the elongation of the choir and the wings which formed the transept. Some English cathedrals have two transepts. The cathedrals in this country also differ from those abroad in their greater length in proportion to their height.

The Anglo-Norman style, the English type of Romanesque [NORMAN ARCHITECTURE], gave way to the Early English—the first type of pure Gothic—through a process of gradual transition. Norman masonry was clumsy and wasteful, and, as the number of churches increased, it became necessary for builders to economise their materials. The introduction of the pointed arch—one of the chief features of Gothic architecture—must be in great measure ascribed to the requirements of vaulting. Vaults were now used over larger areas, and a new method was devised for vaulting over spaces of unequal span. Where the breadth of the space to be vaulted exceeded the portion of the length included in the bay or compartment, instead of the Norman expedients for equalising the height of the transverse semicircular arches and those at the sides, pointed arches were adopted in the latter position. This method is employed not only in the transitional triforium-arcade of Canterbury cathedral, but in the aisles of Fountains Abbey, which is still purely Norman in character. The use of the pointed arch in this and other Norman buildings of about the same date shows that it is not necessarily a mark of Gothic architecture. When the pointed arch came into general use in all parts of the building it was found that it could be more easily adapted to the purposes of vaulting than the semicircular. Other causes may have contributed to bring it into use. In St. Cross church, near Winchester, and on

the wall of Anselm's tower at Canterbury, the pointed form is produced by means of intersecting arcades. Some authorities maintain that it was introduced from the East by the Crusaders.

The Early English (or First Pointed) Style began at the close of the 12th and continued till the latter part of the 13th century. St. Hugh's choir at Lincoln (1192–1200) is the earliest example of pure Gothic. It has been asserted that the remains of the cathedral of St. Denis (about 1140) prove that the



EARLY ENGLISH STYLE (ST. HUGH'S CHOIR, LINCOLN).

style originated in France; but St. Denis is transitional in character, and Dijon cathedral (consecrated in 1230) is the first French building which shows a complete emancipation from Romanesque traditions. Long narrow lancet-shaped windows and slender lofty pillars are the most striking features of Early English architecture. But the leading characteristic of the style is the bold outline of the mouldings, which consist of deeply-cut hollows alternating with firmly-carved rounds, and produce a strong effect of light and shade. The fillet is sparingly used at first, but becomes more common towards the close of the style. The windows are either single or are arranged in suites of two, three, five, or seven, which are sometimes placed so near one another that they resemble the lights of a single window, divided by mullions. The commonest forms of arch are the lancet and the equilateral. Trefoil arches are much used in doorways and other small openings. Small shafts are often placed in the jambs of doorways and windows, and form a mark of the style. The most characteristic form of pillar consists of small detached shafts surrounding a circular pier. The capitals have the shape of a reversed bell, and are often ornamented with the beautiful foliage peculiar to the style. It is termed "stiff-leaf foliage," owing to the stiffness of the stems, but the foliage itself is often free and luxuriant, and is deeply

undercut, so that it stands out in bold relief. Early English towers are generally higher than Norman towers, and most of them have or had lofty octagonal spires. The brooch spire, which rises immediately from the outer surface of the wall without the intervention of a parapet, is a very common form. The roofs have a more acute pitch than the Norman, and the buttresses project more boldly. Flying buttresses spanning over the roof of the aisle, and conveying the thrust of the centre vault to the

style is far more ornate—but because in this style the decoration forms an essential part of the construction, and is not added afterwards to heighten the effect. This is especially true of the tracery in the windows. These are larger than in the Early English style, and consist of several lights, divided by mullions. The arches are usually two-centred. At first the tracery is always of the kind called “geometrical,” consisting of circles, trefoils, and other geometrical forms. Subsequently



(Poulton, Photo.)

DECORATED STYLE (LICHFIELD CATHEDRAL).

side buttresses, and so to the ground, now became common. The vaults are invariably pointed and groined. They seldom have any ribs except the diagonal or groin ribs, the cross-springers or transverse ribs, and occasionally longitudinal and transverse ribs along the ridge of the main and cross vaults. Several kinds of decoration, highly characteristic of Gothic architecture, appear for the first time during this period. It became common to ornament the outside of the building with figures of saints, which were placed in niches, carved on the surface of the wall, and were often arranged in rows, as on the west front of Wells cathedral. The characteristic ornament of this style is the tooth-ornament, which is much used in hollow mouldings. The most beautiful examples of the Early English style are Salisbury cathedral and the choir and transept of Westminster Abbey.

The *Decorated* (or *Middle Pointed*) Style may be roughly said to cover the reigns of the three Edwards (1272–1377). It receives its name not from any superabundance of ornament—the Perpendicular

“flowing” tracery was introduced, so called because the stonework branches out into a variety of graceful curves. The finest windows which exhibit this form of tracery are those at the west end of York Minster and at the east end of Carlisle cathedral. Another kind of tracery common in the Decorated period is the “reticulated,” in which the lines intersect like the threads of a net. There is a beautiful circular window with flowing tracery in the south transept at Lincoln. In cathedrals and large churches the pillars usually consist of four, six, or more shafts clustered closely together, instead of a central pier surrounded by detached shafts, as in the Early English style; and the prevailing outline of the cluster is that of a lozenge, instead of circular. The capitals are either plain or enriched with foliage. Real leaves, such as those of the oak, ivy, and vine, take the place of the conventional trefoil, and are often imitated with great fidelity to nature. They are sometimes represented as growing from a common stalk, which runs round the bell; in other cases each leaf is carved

separately. The mouldings are less bold than in the preceding style, but are usually extremely well carved, especially in early work. The roll, scroll, and quarter-round are the commonest forms. The larger members are generally filleted. Among the minor characteristics which distinguish this style from the Early English may be mentioned the



(Valentine, Photo.)

PERPENDICULAR STYLE (MAGDALEN COLLEGE, OXFORD).

embattled parapets; the niches in the buttresses; the more general use of pinnacles, especially as a termination to buttresses; and the greater abundance of crockets and finials, which are the usual form of enrichment employed in the canopies over niches, the dripstones in the form of a triangle or an ogee which surmount doorways, and other situations of the same kind. The characteristic ornaments of the style are the ball-flower and the four-leaved flower, especially the former. Lichfield cathedral is a small but perfect specimen of purely Decorated architecture.

The Perpendicular (or Third Pointed) Style. Amongst the earliest examples of Perpendicular work are the choir and transept of Gloucester cathedral, begun about 1350, and the west front of Winchester (1360-66). The chief characteristic of the new style is the prevalence of perpendicular lines, which is most conspicuous in the tracery of windows. Horizontal lines are almost as striking a feature as perpendicular; for example, transoms or crossbars dividing the lights of a window into stages now become very common, and are often introduced several times in the height of the window. The doorways are commonly square-headed, and the spandrils between the arch and the outer mouldings are often richly carved. The general tendency of the style to adopt a rectilinear arrangement is very noticeable in the ornamentation; bands of trefoils and similar patterns are freely used to decorate the surface of walls, and sometimes walls and ceiling are almost completely

covered with panelling. The outline of the four-centred arch, which was now much used, was at first bold and impressive, but, as the style advanced, it became more and more depressed. The mouldings consist for the most part of broad, shallow hollows, and the round members have a very slight projection. On the other hand, the style has some characteristic beauties of its own. Among these must be reckoned the lofty and richly-ornamented towers: such as those of Magdalen College, Oxford, and many churches in Somersetshire; the open timber roofs which remain at St. Stephen's church, Norwich, and elsewhere in the eastern counties; and the beautiful fan-tracery vaulting in Henry VII.'s Chapel, Westminster, and St. George's Chapel, Windsor. In Henry VII.'s Chapel, pendants—a common feature of Perpendicular vaulting—are used with striking effect. Early in the 16th century the Perpendicular style was further debased by the admixture of elements derived from the classic styles, which gradually supplanted Gothic architecture, though it lingered on in the Oxford colleges as late as the 17th century.

Gothic Language, the oldest extant member of the Teutonic family. Of this, only one document (and that of the form used by the Mæso-Goths of the lower Danube in the fourth century) survives, the *Codex Argenteus* (Silver Codex), which is preserved in the University of Upsala in Sweden, and which contains portions of the Gospels and other fragments of the Gothic version of the Bible made by Bishop Ulfilas, apostle of the Mæso-Goths, who died about the year 380. Gothic is usually spoken of as a member of the Low German in contradistinction to the High German branch of the Teutonic group; but at that time no such distinction existed, the High German not having yet been differentiated, and it would be more correct to say that it represents the oldest known form of Teutonic speech which was originally of exclusively Low German type. The correct form of the word is *Gotic*, as always written by the people themselves and by the Romans, but the vicious spelling *Gothic*, due to Greek influence, is now too firmly established to be set aside. The language continued to be spoken in Mœsia (the present Serbia and Bulgaria) till the ninth century, when it died out without leaving any issue, as was the case with the Vandal, Burgundian, Lombard, and so many other Teutonic tongues spoken about the same period. [TEUTONIC LANGUAGES.]

Göthite (named after the poet Goethe (q.v.) in his less well-known capacity of Director-general of the mines of Saxe-Weimar) is a hydrous peroxide of iron, containing about 10 per cent. of water, which occurs in transparent red crystals of the Prismatic system, but, more commonly, opaque and yellow or brown. Its hardness is 5 to 5.5 and its specific gravity 3.8 to 4.4.

Gothland, or GOTTLAND, an island in the Baltic, off the S.E. coast of Sweden, and belonging to that country. It has an area of 1,080 square miles, and with the small surrounding islets forms the district of Wisby, so named from the chief town, where in

the fifteenth century the outlawed King Eric X. maintained himself for ten years by piracy. The coast is rock-bound, but good pastoral and arable land exists in the interior, and there are valuable quarries of sandstone and marble.

Gottfried, a meistersinger of Strasburg, who flourished between the twelfth and thirteenth centuries. Of his history little is known, but he seems to have been of good family and to have held some municipal office in his native city. His great but incomplete work, *Tristan und Isolte*, deals with the popular Keltic legend of the Middle Ages. The poem consists of 12,552 rhyming lines, and displays great artistic power as well as deep knowledge of human nature. It has had a powerful influence over German literature. There are no other authentic remains of Gottfried save a few lyrics, the *Lobgesang* and *Gedicht von der Armuth* no longer being regarded as his work.

Göttingen, the chief town of a circle of the same name in the province of Hanover, Germany, is built on both banks of the Leine river in a pleasant valley overlooked by the Hainberg. It is connected by railway with Hanover, 67 miles distant. A mere village in the tenth century, it became from 1286 to 1463 a prosperous member of the Hanseatic league (q.v.). The support which it gave to the Reformation and the misfortunes suffered in the Thirty Years' War reduced it nearly to ruin. In 1734 George II. founded the famous university of Georgia Augusta, and the fortunes of the town revived. A hundred years later the Liberal tendencies of the staff led to the expulsion of seven eminent professors and to the temporary decline of the institution. It has since recovered, and after the annexation of Hanover in 1866 the Prussian Government did much to restore its prestige. Among those who have filled chairs here may be mentioned the brothers Grimm, Ewald, Gervinus, Benfey, Haller, Hermann, O. Müller, Heeren, Blumenbach, and Heyne. Neander and the chemist Bünsen were natives of the town.

Gottschalk, or GOTESCHALCUS FULGENTIUS, the son of a Saxon count, was born about 808 A.D., and trained at Fulda for monastic life. As he grew up he tried to free himself from this career, but only succeeded in getting transferred to the French monastery of Orbais. Here he became an ardent student of the doctrines of Augustine. His views caused him to be cited before two synods, and he was sentenced to be whipped and imprisoned for life as a heretic and a disturber of the peace of the Church. For twenty years he languished in confinement at Hautvilliers near Rheims, Hincmar, the Archbishop, being his chief enemy. Though the question that he raised provoked dire controversy and still remains unsettled, Gottschalk, in spite of his entreaties and the influence of powerful friends, including the Pope, was never released, and on his death was buried in unconsecrated ground.

Gottsched, JOHANN CHRISTOPH, was born at Königsberg in 1700, and became Professor of Poetry in the university there, being transferred in 1734 to

the chair of logic and metaphysics at Leipzig. The great work of his life was the subjection of the German drama to the standard of classical criticism. His own writings for the stage were contemptible, but he collected, under the title of *Die Deutsche Schaubühne* a number of plays by J. C. Schlegel and others, with some translations from the French. His most meritorious production, however, is his *Nöthiger Vorrath zur Gesichte der deutschen dramatischen Dichtkunst*, in which he gives a fair but imperfect account of the efforts of earlier dramatists. He was a pedant, but he did something towards checking the extravagance in style and matter of some of his contemporaries. He died in 1766. His wife was a woman of culture, who translated the *Spectator* and Pope's *Rape of the Lock* into German.

Götz, JOHANN NIKOLAUS, born at Worms in 1721, became a theological student and ultimately a military chaplain at Halle. His fame does not rest, however, on divinity, but on his skill as a translator of Anacreon and a composer of light, elegant, and witty lyrics after the French school. *Thamire an die Rosen* and *An eine Romansleserin* are good specimens of his style. He died at Württemberg in 1781.

Gouda, or TER-GOUWE, a town in the province of South Holland, Netherlands, at the junction of the Gouw and the Yssel, eleven miles by railway from Rotterdam. It dates as a town from the end of the thirteenth century, and its early prosperity was derived from brewing, weaving, and the making of tobacco-pipes. It is now the great mart for Dutch cheese, and the Groote Markt is the largest in Holland. The town is well laid out and intersected by many canals, the suburbs being planted with trees. The church of St. John is a fine sixteenth-century structure, containing admirable painted glass and a famous organ. The Town House, rebuilt in the Gothic style (1690), has architectural merits. There is a large general trade both in imports and exports.

Gouge is a special form of chisel with its cutting edge shaped into the form of an arc. Gouges are much used in carpentry where curved hollows have to be cut, and in wood-turning where it is desirable that the cutting should be local, that the tool should be allowed a certain amount of play to right or left, and that it should be strong enough to resist sudden shocks.

Gough, SIR HUGH (VISCOUNT GOUGH) (1779-1869), was born at Limerick. In 1793 he joined the Limerick militia, and in 1795 became lieutenant in the 7th Highlanders. After being present at the capture of the Cape of Good Hope he went to the West Indies, rising to the rank of captain in 1803, and being in 1805 major in the 87th regiment, the Faugh-a-Ballaghs. He was present at Talavera, Barossa (where his regiment captured an eagle from the French), Tarifa, Vittoria, and Nivelles. After a period of partial retirement he was sent to India in 1837, and served in China, and again in India at Mudki, Sobraon, Chillianwallah, and Gujerat.

Gough, RICHARD (1735-1809), an English antiquary, was born in London. He showed when quite young a great aptitude for translation, and at sixteen wrote *Geography Modernised*. His chief works were an edition of *Camden's Britannia*, and *Sepulchral Monuments of Great Britain*, and he produced many smaller works. He was made F.S.A. in 1767, and director in 1771, and F.R.S. in 1775. His books, etc., were bequeathed to the University of Oxford.

Goujon, JEAN, a French sculptor of the 16th century. In 1540 he executed a statue for the cathedral of Rouen, and then went to Paris, where he helped adorn the Louvre and St. Germain-l'Auxerrois. The *Diane Chasseresse* of the Louvre is said to be his work. His effects closely approached the classic style.

Gould, JAY (1836-1892), an American financier, was born at Roxbury, New York. His one ambition was to gain money and the power it brings, and his attention being drawn to railways he so manipulated their stock as to become fabulously rich and to dominate the American stock markets.

Gould, JOHN (1804-1881), an English ornithologist, was born at Lyme in Dorset. His father became foreman of the Royal Gardens at Windsor, and the son took great interest in natural history. In 1827 he was appointed curator of the Zoological Society's Museum. In 1832 he published *A Century of Birds from the Himalaya Mountains*, in 1834 *Ramphastideæ*, in 1837 *Birds of Europe*. Other works of his are *Birds of Australia*, *Mammals of Australia*, *Family of Kangaroos*, *Birds of Great Britain*.

Gounod, CHARLES FRANÇOIS, born 1818 at Paris, an eminent French composer. He was educated at the Paris Conservatoire, and in 1839 went to Rome, where he gave his mind chiefly to religious composition. A result of this was his *Messe Solennelle*, published on his return to Paris. In 1837 the opera of *Sappho* appeared. His most admired work, *Faust*, was published in 1859. The other most important of his works are *Philemon et Baucis*, *Mireille*, *La Reine de Saba*, *Roméo et Juliette*, and *Polyeucte*. An oratorio, *Redemption*, was performed in Birmingham in 1882, and *Mors et Vita* was produced in 1885. His style shows a curious mingling of religious and secular treatment.

Goura, a genus of pigeons, with two species, from New Guinea and the neighbouring island. They are large birds, with greyish-blue plumage, and large semicircular crest, nesting in trees, but seeking their food on the ground. *G. coronatus* is often seen in captivity. The flesh is excellent.

Gourami, the native name of *Osphromenus olfax*, a fish of the family Labyrinthici from the rivers of the East Indian Archipelago. The head is small, the body compressed and elevated, the dorsal and anal fins bear numerous spines, and the outer ray of each ventral is produced into a long filament. This species, which is a valuable food-fish,

is domesticated in the East, as the carp is with us, and is said to attain the size of a large turbot. It is one of the few fishes that build nests, and it watches over the young after they are hatched. The Fighting-fish (q.v.) is closely allied.

Gourd, a name given to various plants of the order *Cucurbitaceæ* and especially to the genus *Cucurbita* and to the fruit rather than to the rest of the plant. They are trailing annuals with palmately-lobed leaves, unbranched tendrils, and large yellow monœcious flowers, which hybridise so freely as to render it well nigh impossible to discriminate the parent specific forms of the long cultivated races. The fruit is inferior, and has a horny exterior when ripe. They are abundant in tropical and temperate Asia; but some may be indigenous in America. *Cucurbita maxima*, the yellow or red gourd, will grow in the south of England, and sometimes bears a fruit weighing over two cwt. *C. Pepo* is the pumpkin, which is largely cultivated, especially in the United States, as food both for man and beast. *C. ovifera*, the vegetable marrow, the form most grown in England, is apparently a variety of the pumpkin. *C. Melopepo*, the squash, with fruits of various subangular forms, is also largely cultivated in America. The elongated and well-named snake-gourds of India and China belong to a separate genus, *Trichosanthes*, as do also the bottle-gourds, *Lagenaria*, hollowed out in the East, when ripe, into bottles, basins, or spoons. All gourds have a tendency to secrete the powerfully purgative principle *colocynthin*, especially in the ripe rind and seeds. [COLOCYNTH.]

Gout (derived from the Latin *gutta*, a drop) is a disease in which the substance called urate of soda becomes deposited in the cartilages of joints and in certain other situations. The name for this disease among the ancients was *podagra* (from two Greek words signifying an attack of pain in the foot). In the Middle Ages it was supposed that some morbid principle escaped from the blood into the joints, and hence arose the name gout. It is now known that the characteristic seizures of gout are always associated with deposits of urate of soda in the joints, that of the big toe being involved with especial frequency. Other changes in the tissues have been shown of recent years to be commonly associated with gout. Of these the granular or gouty kidney, and hypertrophy of the heart may be especially alluded to. Gout is most common in men of middle age, and there can be no doubt that heredity plays an important part in its production, and over-eating, over-indulgence in alcohol, and want of exercise are, apart from the inherited disposition, the three main factors concerned in the causation of gout. The first attack of the disease affects, as a rule, the right great toe joint. The pain usually commences, in the first instance, at night-time, and may continue (with intervals of comparative relief) for several days. Later attacks may extend to other joints, and, when the malady becomes chronic, these joints become swollen and deformed, and nodules may appear in the surrounding tissues, consisting

of uratic deposits. Thus the toes and fingers may be ultimately covered with what are called "chalk stones." Similar deposits affecting the lobe of the ear are termed *tophi*. Dr. Garrod has shown that the blood at the time of an attack of acute gout contains urate of soda in abundance. Gouty patients are usually liable to dyspepsia, and many other troubles occur in connection with the disease. The chief of these are headache, various neuralgic pains, palpitation, bronchitis, and emphysema, kidney mischief, bladder troubles, and various skin affections. Apoplexy is especially common in gouty subjects, and a peculiar, ill-understood, and serious group of symptoms sometimes supervenes immediately on the subsidence of an attack of gouty inflammation. To these the term "retrocedent gout" is applied. The treatment of the disease comprises first that of the acute inflammation, and secondly the general *regimen* to be adopted between the attacks. The most valuable drug for the relief of the pain and distress of acute gout is colchicum; lithia salts have also been much used in recent years. As regards *regimen* the most important point is the limitation in the amount of alcohol taken by the patient, best of all its complete exclusion from the dietary. Excess in eating is also to be avoided, in particular all kinds of flesh should be taken in limited quantities, and all rich and highly-spiced foods should be eschewed. Hot baths, Turkish baths, tonics, and regular exercise are valuable adjuncts in the treatment of chronic forms of the disease.

Govan, a town of Renfrewshire and Lanarkshire, on the S. bank of the Clyde, forming a suburb of Glasgow. The chief industry is ship-building. A public park of 40 acres was given to the town in 1885.

Government. The word "Government" denotes (1) the regulation of a political society; (2) those to whom this regulation is entrusted, or, in a more limited sense, those who take the chief part in the conduct of public affairs.

A political community, as Austin pointed out, is analysable into—on the one hand, a "sovereign" who issues laws sanctioned by a penalty in case of disobedience (such laws being distinguished from other commands as "positive laws"), and, on the other hand, a subject body which owes obedience to those laws. The sovereign may consist of one person or of more than one. A sovereign body may delegate its powers to a so-called "government," and at the same time retain the ultimate control over political action. It follows from this analysis that such an expression as "local self-government" is correct only in a limited sense, since the local body does not exercise sovereign authority. The sphere of government comprises both the affairs of a community itself and its relations with other communities. The control of these two departments or of the constituent parts of either of them may be vested in different bodies, so that the sovereign body proper becomes still more complex. This is the case when a state forms part of a federal union with a central authority, or occupies

a dependent or semi-independent position under a more powerful state.

Origin of Government. Ancient nations attributed their constitutions to the enactments of some semi-mythical legislator, as, for example, Solon and Lycurgus among the Greeks. The political struggles of the 17th century, combined with the growing spirit of inquiry, resulted in various attempts to explain the origin of government in general. The most important was the theory of the Social Contract, first promulgated by Hobbes (q.v.). The speculations of the time were all coloured by the desire to advocate some particular form of government. Hobbes wrote in support of the royal authority, and the same political views gave rise to the very different doctrine of the divine right of kings. Locke (q.v.), on the other hand, modified the theory of the Social Contract, so as to make it an argument for the maintenance of popular rights. In the 18th century the theory was revived in a new form by Rousseau (q.v.). In recent years the comparative method of inquiry has been applied to the study of early societies. The results so far obtained go to prove that the state resulted from a union of families or tribes under the hypothesis (often an almost avowed fiction) of descent from a common ancestor. Hence the rulers were supposed to represent this ancestor, and analogies from the organisation of the family were imported into the state.

Forms of Government. The organisation of most modern states is highly complex, including many institutions which represent earlier stages of national development and have lost much of their original significance, but are retained either through mere attachment to old traditions or in order to secure steady and uniform progress in the future. The sovereign power is thus divided unequally amongst several constituent parts, or those who really possess it occupy a subordinate place in the theory and external framework of the government, so that it becomes difficult to find any general principle on which to classify the states now existing.

If due allowance is made for altered conditions, the classification of the ancient philosophers, especially Aristotle, which was based on the numerical proportion between the rulers and the ruled, may still be considered applicable. Aristotle distinguished between the rule of one man, of the few, and of the many, and each of these is good or bad according as to whether it aims at the welfare of the community or the private interest of the ruler or rulers. We have thus three pairs of converse types—Monarchy and Tyranny, Aristocracy and Oligarchy, Commonwealth ("Politia") and Democracy. The rule of the few becomes an oligarchy when power falls into the hands of a small rich class, and that of the many a democracy when the government is carried on in the interests of the needy, who have nothing to lose and are always eager for change. The defects of Aristotle's exposition are the result of the political circumstances of his age. He had no notion of constitutional progress or representative government, and the value of his views, especially in regard to democracy, was further

impaired by the fact that they were drawn from a state of society in which most manual labour was carried on by slaves.

A proper understanding of the present systems of government can be acquired only by the study of constitutional history, which shows how the sovereign body in each country has gradually assumed its present form. The prevailing type is "constitutional monarchy"—an expression which is really self-contradictory, since monarchy implies a single ruler, and in this case the free action of the crown is limited not only by the terms of the constitution, but by the functions of those to whom it assigns a share in the sovereign power. Since the Revolution, England has been the model of a "constitutional monarchy," and her institutions have been imitated by various other countries. The tendency of this form of government seems to be towards democracy. The United States of America furnish a good example of a republic resting on a federal basis. Another principle which has been active in modern times is that known as Cæsarism, in which the rule of an autocrat is supposed to be sanctioned by the consent of the governed.

Sphere of Government. The free discussion of political measures which has accompanied the growth of democracy has naturally raised the general question: "What matters ought to be subject to Government control?" On this question there are two schools: the supporters of *Laissez-faire* (q.v.), who would limit State interference to the protection of life, liberty, and property, and those who advocate "paternal government" or State Socialism. [SOCIALISM.] *Laissez-faire* became the ruling principle during the epoch which witnessed the revolutionary movement throughout Europe and the growth of the present industrial system, but recently there has been a strong reaction in favour of paternal government.

Governor, in *mechanical Engineering*, is a contrivance for regulating the speed of a machine. Every prime mover, such as a steam-engine or an electric motor, is liable to change of speed either by variation in the supply of power or by variation in the amount of work that it is made to perform. The governor is intended usually to regulate the supply of power according to the demand that is being made on the machine, but a contrivance such as a fly-wheel, which in some sense acts as a governor or regulator of speed, does not affect the supply of power to the engine, but acts as an accumulator of energy, from which all supplies for any external circuits must be drawn. [FLY-WHEELS.] Where the speed of the engine is to be rendered constant by regulating the supply of power given to it, it is usual for a governor to be introduced that is affected by fluctuations of speed, and that mechanically corrects the disturbance produced. Thus, if a steam-engine driving a quantity of machinery be suddenly relieved of its load by disconnecting the machinery, it will tend to increase its speed rapidly and dangerously. But if its crank-shaft be made to rotate a vertical spindle on each side of which heavy metal balls

are hanging, by centrifugal force these balls will fly outwards and upwards to a definite extent depending upon the speed of the crank-shaft. The supposed increase in the speed will lift the balls still higher, and by a simple mechanical contrivance they may be made to lift a collar on the spindle and through this to diminish the steam-supply to the engine. The old plan was for the governor to act on a throttle valve in the steam-pipe, which closed or opened as the governor balls rose or fell, but there was much waste of power at the valve, and it was a great improvement to make a governor act on the link motions (q.v.) that determine for what length of stroke steam is to be admitted to the cylinder. When the speed tends to increase, cut-off of the steam takes place early in the stroke. If the load is heavy and the speed tends to diminish, steam is admitted for a greater portion of the stroke. A gas-engine governor will regulate the amount of gas passing into the cylinder of the engine. When the load is light, little or no gas may be admitted, and the explosions are either very slight or else do not occur at all. It is still an objection with most governors that they are only brought into action by the occurrence of that which they are intended to prevent—that is, instead of preventing fluctuation, a governor can only act when fluctuation occurs. To avoid this it should be designed to work its mechanism with extreme rapidity—to act as soon as a tendency to fluctuation manifests itself. [STEAM-ENGINE, GAS ENGINE.]

Gow, NEIL (1727–1807), a noted Scottish fiddler, was born at Inver, near Dunkeld. He soon became renowned for his reels and strathspeys, and was much patronised by the great. His son, NATHANIEL, composed the favourite ballad *Callin' Herrin'*.

Gower, JOHN (circa 1325–1408), an English poet, was born in Kent. He was a friend of Chaucer, and is alluded to by Shakespeare, who sometimes introduces him as a kind of chorus. Becoming blind, he retired to the Priory of St. Mary—now St. Saviour's, Southwark—and he partly rebuilt the church, in which he was buried. He wrote *Ballads and other Poems* in French, *Speculum Meditantis* (a treatise on married life), *Vox Clamantis*, in Latin elegiacs, and giving an account of the rising of the Commons in Richard II.'s reign, and *Confessio Amantis* (his best-known work), which is a curious but tedious collection of classic and mediæval tales with a slight binding thread running throughout.

Gown, a long, loose outer garment, worn by clergymen, members of universities, judges, and others. The ecclesiastical gown was originally intended for out-of-door use, but came to be used by preachers when addressing large congregations. The "Geneva gown," which resembles the academic, was introduced by the Geneva reformers, and continued in use amongst the Puritans and the Evangelical clergy. It is now rarely seen in the Anglican Church, but is still worn by Presbyterian and other Dissenting ministers. The purple gown is a distinctive mark of rectors of universities. In

Great Britain the faculty, as well as the university, of a graduate is now denoted by his hood. The members of the older English universities now have black gowns, for which a surplice is substituted in college chapel on Sundays and saints' days by those on the foundation. The academic gown is worn in the pulpit by university preachers.

Gowrie Conspiracy, a plot by Alexander Ruthven and his brother, the Earl of Gowrie, to murder or kidnap James VI. of Scotland, afterwards James I. of England, alleged to have taken place on August 5, 1600. The truth of the story has always been considered very doubtful, owing both to the strangeness of the details and the apparent absence of any motive on the part of Gowrie and his brother for wishing to kill or imprison the king. James, on the other hand, was indebted to the Ruthven family for a heavy sum, and may also have had political reasons for wishing to rid himself of the brothers.

Goya y Lucientes, FRANCISCO (1746-1829), a Spanish painter, born in the neighbourhood of Saragossa. He studied there, and at the age of 16 went to Madrid, where he distinguished himself by his wild life. He then went to Rome with a company of bull-fighters, and seems to have met with many vicissitudes of fortune. In 1775 he was back in Madrid, where he executed paintings for the royal tapestry factory. The king's painter took him up, and he was commissioned to execute some frescoes and other works. He was also successful as a portrait-painter, the Duke of Wellington being among his sitters; but his great forte was *genre*, and his paintings of bull-fights—a subject with which he was thoroughly acquainted—have been much admired.

Goyaz, capital of a province of the same name in Brazil, in the valley of the Velmelho, a tributary of the Araguaia, 650 miles N.W. of Rio de Janeiro and 700 miles S.W. of San Salvador. It is the seat of a bishopric and of the Provincial Assembly, and has a President and a military governor. The streets are broad, and there are good houses and fine squares. Among the public buildings are the Legislative Chambers, the Court-house, hospital, prison, etc. It was originally called Santa Anna.

Gozzi, CARLO, COUNT (1772-1806), an Italian dramatist, was born at Venice. He joined the Granelleschi Society, which had for one of its objects the preservation of pure Tuscan literature. Gozzi aided in this by parodying Chiari and Goldoni, who had introduced the habit of imitating the French. His works, which were interpreted by the Sacchi Company and were in many cases pieces founded on fairy tales, were for a time very popular. They were published in 10 volumes in 1792.

Gozzoli, BENOZZO (latter half of the 15th century), was a Florentine painter who aided Fra Angelico, whom he accompanied to Rome, and by whose style he was greatly influenced. He painted a fresco of *St. Anthony and Angels*, a *Madonna and Child with Saints*, and many other works, among them being an altar-piece, *St. Thomas Receiving*

Our Lady's Girdle, now in the Lateran Museum. The frescoes in the Campo Santo at Pisa are attributed to him; at Perugia he painted a *Madonna with Saints*, and at Florence the *Journey of the Magi to Bethlehem*. The National Gallery, London, has a painting of his, *Madonna with Child and Saints*.

Graaf, REGNIER VAN (1641-1673), a Dutch physician and anatomist, was born at Schoonhoven. He studied at Leyden and in France, and took his M.D. at Angers in 1665, after which he practised at Delft. In 1663 he published a *Treatise on the Pancreatic Juice*, which brought him some renown. He studied much the organs of generation, and gave his name to his discovery of the Graafian vesicles of the ovum in 1672. His collected works were first published at Leyden in 1677.

Graafian Follicles. [OVARY.]

Gracchus, the name of a family of the Roman gens Sempronia. The first member of the family to attain importance was (1) TIBERIUS SEMPRONIUS GRACCHUS, who became *magister equitum* after the battle of Cannæ, and was consul 215-213 B.C. (2) TIBERIUS, who married Cornelia, daughter of Scipio Africanus, the model Roman matron, esteemed for the manner in which she devoted herself to the education of her children. This Tiberius conquered the Celtiberi, but won their hearts by the kindness and justness with which he treated them. He afterwards became consul, and as censor, though severe, was highly regarded. His two sons—Cornelia's "jewels"—were TIBERIUS and CAIUS, who were two of the most prominent men in Roman history. [ROME.] The distinguishing features of all the family seem to have been loftiness of character combined with fascination of manners.

Grace, in its Scriptural sense, denotes both the free favour and love of God towards men, which they have done nothing to deserve, and the condition of those who enjoy this divine favour. Divines have distinguished between *common* or *general* and *special* or *particular* grace. The former is identical with the light of nature or conscience, and is granted to all mankind, while Christians alone receive the gift of special grace, which endows the recipient with spiritual knowledge and stimulates him to all good works.

Graces, Greek goddesses, who were impersonations of all that is glad and beautiful in the world and in human nature. They are generally represented as the daughters of Zeus and Eurynome. Their names and number vary; according to Hesiod and Pindar, there were three—Aglaia, Euphrosyne, and Thalia. They served Aphrodite, and conferred grace and beauty on human beings.

Gradient means the inclination of a road or railway to the horizontal. It is measured in terms of the vertical height ascended or descended for a given length traversed along the slope. If the fall along four miles of road be 44 feet, the gradient is said to be 11 feet per mile or 1 in 480. The choice of gradient is very important in the economy of railway design. The route is generally so planned that the amount of excavation in the formation of

the railway shall be roughly equal to the amount of embankment necessary where the route is to pass over low-lying levels. This condition usually imposes a limit on the gradient, though not necessarily so. Except in special cases where steep gradients are unavoidable, they are not allowed to exceed 1 in 60, the prevailing gradient on many good English lines being 16 feet to the mile or 1 in 330. If a high level has to be traversed, it is preferable to effect it in a series of short steep gradients with level interspaces between them rather than in a single uniform gradient upwards throughout the whole length. The locomotives are thus enabled to recover steam at each level stretch. Specially steep gradients require locomotives of unusual construction. Appliances for increasing the adhesive power on the rails are used, or else a pinion works in a toothed rack laid along the line of railway, so that retrograde motion can only occur when the teeth break. In the Zermatt railway in Switzerland the maximum gradient on the adhesive sections is 1 in 22, and on the rack and pinion sections 1 in 8.

Gradual, an antiphon or sentence, usually taken from the Psalms, which is sung to "plain chaunt" melodies after the epistle in the Communion service. It was so called because sung whilst the priest was ascending the steps (Latin *gradus*) of the ambo (q.v.) to read the Gospel. The word also denotes a service-book containing plain chaunt melodies.

Graduation means the process of marking scales on measuring instruments. If the instrument is to measure some physical quantity directly, the scale reading may be marked in terms of that physical quantity, or it may be marked in inches of length, degrees of angular measurement, or in some other convenient numerical units, whose physical interpretation is obtained by calibrating the instrument. [CALIBRATION.] The simplest example of graduation is that of scales of linear measurement. This is done by a dividing engine, which consists essentially of a well-turned screw that can be made to move a sharp cutter through exactly equal distances, and thus mark the scale uniformly. Rough graduation may be effected by hand with the aid of compasses. For the accurate marking of a circular scale it is necessary, in the first place, to subdivide a circular arc into any number of equal parts. Though such an operation can be effected in the case of a straight line, no geometrical process is known by which a circular arc can be so divided; but any arc may be bisected, and the process of bisection of each half repeated indefinitely. Other subdivision may be done approximately by systematic trial with compasses. Circular dividing-engines consist essentially of a circular horizontal plate, carefully graduated and capable of rotation by means of a tangent screw. The cutter moves radially in one direction, and the scale to be marked is rotated with the graduated plate. The markings on metal or glass scales are made by coating the scale with wax, cutting lines on the wax with the compass or dividing-engine, and thus exposing the metal or glass underneath. This is then subjected to the action of acid, usually

nitric for metals and hydrofluoric for glass. When the wax is cleared away, the scale will be found permanently engraved.

Graffiti, rude scribblings scratched with a sharp instrument, or inscribed in red chalk or charcoal on the walls and pillars of ancient buildings in southern Italian towns. They are especially abundant at Pompeii, and there are several on the Palace of the Cæsars and Nero's Golden House at Rome. They include both drawings and remarks or quotations, and have much the same general character as similar effusions of the present day, but some of them are memoranda relating to the events of daily life. Their importance consists in the light they throw on the life and speech of the people at the time. The graffiti found in the catacombs, which are of a different character, were placed there by the early Christians.

Grafting, or "WORKING," as gardeners sometimes term it, consists in the transfer of a branch, known as the *graft* or *scion*, from one plant to another, which latter is called the *stock*. It is essential that the cambium-layers or growing tissue of the two should be brought into close contact. The usual object of the process is to bring about earlier or more abundant flowering or fruiting, so that many stocks, from their effect on the scion, are what are termed *dwarfing-stocks*. The chief modifications of the process are (1) *whip-grafting* or *tongue-grafting*, in which the stock is cut back obliquely, a slice pared off one side and a *notch* made on the sliced surface, whilst the scion is cut obliquely and then a *whip* or *tongue* cut on its oblique surface to fit the notch, the whole being bound round with wet bast and clay; (2) *side-grafting*, which differs in no notch and tongue being made and the stock being often not headed back, the most frequent object of this process being simply to add a side branch to improve the form of a trained tree; (3) *cleft-grafting*, in which the stock is headed off horizontally and then cleft down the middle, the scion being cut into a thin wedge and inserted in the cleft; (4) *crown* or *rind-grafting*, in which a slit is cut in the bark and the scion inserted between it and the sap-wood; and (5) *root-grafting*, practised commonly in the case of dahlias and peonies, in which young shoots are inserted into a fleshy root, the junction being then covered with the soil. *Inarching* only differs from side-grafting in that the scion is not severed from its parent tree until its union with the stock is complete. As a rule, stock and scion, though united, retain their several characters; but undoubted cases of *graft-hybrids* occur, of which the most remarkable is *Cytisus Adami*, a tree bearing some branches, leaves and flowers intermediate in character between those of the common laburnum (*C. Laburnum*), its stock, and *C. purpureus*, its scion. [BUD.]

Grafton, AUGUSTUS HENRY FITZROY, DUKE OF (1735-1811), an English statesman descended from Charles II. In 1763 he entered practical politics as the opponent of Lord Bute, and two years later became Secretary of State in Lord Rockingham's

Government. In 1766 he was First Lord of the Treasury in Lord Chatham's Government, and owing to Lord Chatham's illness he had to manage the Government till his resignation in 1770. In 1771-75 he was Lord Privy Seal in Lord North's Administration, and in 1782 he took the same post under his old chief, Rockingham. His name has been familiarised to the world through the bitter attacks made on him in the *Letters of Junius*.

Graham. [CLAVERHOUSE.]

Graham, SIR JAMES ROBERT GEORGE (1792-1861), an English statesman, was born at Naworth in Cumberland. He was educated at Westminster and Queen's College, Cambridge, and, after making a tour abroad, was appointed private secretary to the British Minister in Sicily. In 1818-20 he sat as a Whig in Parliament for Hull, changing his seat for that of Carlisle in 1826. He wrote upon *Corn and Currency*, and, having in 1830 been elected for the county of Cumberland, he became First Lord of the Admiralty under Lord Grey; but in 1834 he left his party, and joined the Conservatives. In 1838 he sat for Pembroke, and in 1841, while member for Dorchester, he became Home Secretary under Peel. At this time his views about the Scottish Church and his opening of letters which were in charge of the Post Office gave offence to many. In 1852 he was First Lord of the Admiralty under Lord Aberdeen, and in Lord Palmerston's Government, but the questions that arose over the conduct of the Crimean War caused his retirement.

Graham, THOMAS (1804-1869), a Scottish man of science, was born at Glasgow, where also he graduated. After working at Edinburgh, he lectured at Glasgow, and afterwards was appointed Professor of Chemistry at University College, London. He was made Master of the Mint, a post which he held till his death, but which took him off from his scientific work. His researches were chiefly made in the direction of atomic motion, the passage and diffusion of gases, and the spontaneous movements of liquids.

Grahame, JAMES (1765-1811), a Scottish poet, was born at Glasgow. He was educated at the university there, and studied for the Bar, but in 1795 he took orders in the Church of England, and became curate, first in Gloucestershire, then in Durham. His chief works are *Mary Queen of Scots*, *Sabbath*, *British Georgies*, *Birds of Scotland*, and *Poems on the Abolition of the Slave Trade*.

Grail. [HOLY GRAIL.]

Graining. [LEUCISCUS.]

Grains of Paradise, the export of which gave its name to the Grain Coast of West Tropical Africa, are the pungent seeds of *Amomum Melegueta*, a member of the ginger family. They used formerly to be employed with ginger and cinnamon in making the spiced wine known as Hippocras; but are now mainly used in cattle-foods and cordials. They were perhaps once used by publicans to give a semblance of strength to beer, but their costliness would prevent this being done to any extent, even if it were not prohibited under heavy penalties.

They are not, however, deleterious, but are less aromatic than cardamoms (q.v.).

Grain Tin. When tin is refined, the purest portions are taken aside for the production of "grain tin." This is obtained by reheating the metal to a temperature just below its melting point, and allowing it then to drop from a height, when it breaks up into long prismatic masses which are known in commerce by the above name.

Grakle, GRACKLE, a common name for several tropical and sub-tropical birds of the Starling family. [MYNAH, STARLING.] The name, with some epithet, is loosely used in the United States for some of the Hang-nests (q.v.).

Grallæ, GRALLATORES (WADING BIRDS), an old order of Birds, in which were included cranes, herons, storks, bitterns, plovers, snipes, curlews, rails, etc. It was approximately equivalent to Orders x., xvii., xviii., xix., and xx. of Dr. Bowdler Sharpe's classification. [BIRDS.]

Gram, an Indian name for several kinds of pulse, especially the chick-pea (q.v.), Bengal or common gram, *Cicer arietinum*; the horse-gram of Madras, *Dolichos uniflorus* and *D. biflorus*; the green gram, *Phaseolus Mungo* and *P. Roxburghii*, and the black gram, a variety (var. *melanosperma*) of the former. They are largely eaten by the natives, and upwards of 15,000 tons are annually exported, chiefly to Mauritius, Ceylon, and Singapore, as horse- and cattle-food.

Grammar. The word "grammar" is used in three senses:—(1) The forms and usages of a language or of language in general; (2) the study of such usages; (3) a treatise or text-book in which they are explained. It will be well to begin by inquiring into the sphere of the study of grammar.

Grammar, the science of lingual sound, is a part of Philology (q.v.), the general science of language. It deals with the forms both of words and of sentences. Its starting-point is the sentence—the expression of a definite thought; for it is only when the sentence is formed that organised speech begins. The form of a word is determined by its relation to other words in the same sentence. But in some languages (called analytic) words do not change their form; in this case their mutual relations are expressed by the order in which they are arranged—in other words, by the form of the sentence. Even in synthetic or inflexional languages the relations of words are shown by their position as well as their form. Further than this, complex thoughts are expressed by the combination of several sentences, which enter into relations one with another similar to those of the separate words in a simple sentence. Grammar, therefore, falls into two divisions:—Etymology, which deals with the forms of words, and Syntax, which is concerned with the arrangement of words in simple and of clauses in complex sentences.

The researches of philologists have shown that the laws of language can be ascertained only by studying its development and comparing languages one with another. Grammar is thus no longer confined to the schoolroom, but has become a

branch of inductive science. Side by side with the old formal grammar we have now *historical* grammar, which follows the growth of a single language, and *comparative* grammar, which is based on the historical grammars of allied languages, and traces their common forms up to their original source. As the comparative grammars of the Aryan, Semitic, and other families of languages become more firmly established, material will be furnished for *universal* grammar, which aims at expounding the principles common to all forms of speech.

In the Aryan languages (q.v.) comparative grammar has already made great progress. All the words in these languages may be regarded as having sprung from a small number of crude forms called "roots," each of which expresses some bare rudimentary notion, standing out of all connection with any other notions. With roots as such the grammarian is not directly concerned. They become words by means of three different processes: (1) their arrangement in sentences, (2) the addition of suffixes, (3) variations in the original vowels. The addition of a single suffix to the root sometimes gives a complete word, but more frequently a "stem" is first of all formed, from which words are afterwards developed by the addition of further suffixes. Thus, from *fat*, the Teutonic form of the Aryan root *pad* [GRIMM'S LAW], denoting motion, is derived the stem *fotu-*, from which is formed the Gothic substantive *fotu-s*, our *foot*, answering to the Latin *pes* (shortened from *ped-s*). Often a word is formed by attaching several suffixes, one after the other, with the same or a different signification. Flexion by vowel-change is of two kinds: "mutation" (German *umlaut*) and "gradation" (*ablaut*). Mutation is due to the influence of a lost inflexion. Thus, *man* became *men*, because the plural was originally formed in *i*. Gradation took place through a weakening of the root vowel. Thus, the *i* of the present *spring* and the *u* of the participle *sprung* are weaker forms of the *a*, which appears in the past tense *sprang*.

Of our eight "parts of speech," the *interjection* alone has little or no history. *Interjections* are merely natural cries expressing emotion, and date from a period antecedent to the growth of grammatical structure. The origin of the *substantive* and the *adjective* is identical, for both an object and a quality of an object were expressed by a noun. The *pronoun* is simply a noun of wide application—e.g. *this* and *that* are words of larger meaning than the particular person or thing with reference to which they are used. The origin of the *adverb* is evident from the corresponding use of certain cases of nouns. Thus, in the sentence "The messenger arrived speedily," for "speedily" we can substitute "with speed," which before the loss of the case-inflexion was represented by *spêdum*, the instrumental or dative plural of *spêd*. In the same way "speedily" itself and all other adverbs were originally cases of substantives, adjectives, or pronouns. The adverb became a *preposition* when its force was further defined by the addition of a noun. Thus, in the sentence "He is putting on his coat," "on" is still an adverb, qualifying the verb "put;" but, in the sentence "He is

putting his coat on his back" it has become a preposition, connecting the coat with the back. The *conjunction* is an adverb or adverbial form used for the purpose of linking sentences or clauses. Most conjunctions were originally cases of pronouns, which were used with an adverbial force at the head of one clause to represent that going before.

The study of primitive word-formation and the evolution of the "parts of speech" shows that the Aryan languages have passed through two stages. The first stage was one of synthetic growth; during the second new parts of speech arose to take the place of the old inflexions. There was no sudden transition from one stage to the other, for word-formation never ceases entirely, and the inflexional element always remains predominant, but these languages show a general tendency to substitute an analytic for a synthetic structure. Some of the processes through which they have been developed may now be examined a little more closely. In the first place, in early times there was a greater variety in the forms produced through composition with inflexional suffixes. The conjugation of the verb, for example, was much more elaborate than it afterwards became. This change shows an unconscious effort after greater uniformity and simplicity in the use of grammatical forms. Again, the vocabulary was continually enriched by a more extensive use of prefixes and suffixes. The employment of suffixes at a late period to form new words is especially noticeable in the case of abstract nouns and adjectives. In the Teutonic languages, as in Greek and Latin, an immense number of compound verbs, expressing different modes of the same action, were formed by prefixing prepositions to simple verbs. The origin of the adverb is an example of the way in which an inflected form may become isolated or petrified, and eventually gave rise to a new class of indeclinable words. Thus the termination of the Greek ablative survived as an adverbial suffix after it had disappeared from the declension of nouns, and could be used to form new adverbs of manner. This sometimes happens when the inflexion is not entirely lost. Thus, the genitive termination *es*, which remains in our possessive case, appears also in *needs* and *once*, which served as models for *always*, *sometimes*, and other later formations. Inflexions disappear through natural decay, but the process may be hastened by accidental circumstances. In England the Norman Conquest had this effect. The Normans did not understand the English endings, and so they dropped out of use. The result is that English is less inflected than cognate languages, such as German. Finally, we must notice the influence exercised by literature in settling the form of a language. A standard is thereby given to which local usage conforms, and in this way the customary modes of expression become stereotyped. But a language always retains a certain amount of flexibility, and the grammar of each new generation differs in some degree from that of the preceding.

Gramme is the standard French unit of mass. Its weight at Paris is the standard of weight. A

gramme mass is defined as that of a cubic centimetre of distilled water at 4° C., the temperature of greatest density of the liquid. It is an equivalent mass to 15.43248 grains troy, but by reason of the difference of intensity of gravity in Paris and in London this number does not express the relation between their weights, one gramme weight being equivalent to 15.43234 grains troy weight or .00220462 lb. avoirdupois weight. The unit is divided into 10 decigrammes, 100 centigrammes, or 1,000 milligrammes; multiples of the gramme by 10, 100, 1,000 and so on, are termed the decagramme, hectogramme, kilogramme, myriogramme, and the quintal.

Gramont, PHILIBERT, COMTE DE, a French courtier (1621-1707), was the descendant of the husband of Henry IV.'s mistress. He distinguished himself in war, and his handsome person and witty mind made him a favourite at the Court of Louis XIV., from which, however, his dissoluteness caused him to be banished in 1662. He was received with open arms at the Court of Charles II., where he rivalled all in licentiousness. He married Miss Hamilton, and her brother Anthony wrote Gramont's memoirs.

Grampians. (1) Sometimes taken as signifying the chain from Dumbarton to Stonehaven, and sometimes as synonymous with the main system of the Scottish Highlands, and including Ben Nevis, the Cairngorm Mountains, Schiehallion, etc. (2) A range in the W. of Victoria, Australia, 5,600 feet high.

Grampus (*Orca gladiator*), the sole species of the genus, the largest of the Dolphin family, and the only known cetacean that preys on its fellows. These animals, popularly called "killer-whales," hunt in packs, and attack even the Greenland whale. They are very widely distributed, the length ranges from 18 feet to 30 feet, and the colour is glossy black above and white beneath, with a white patch over the eye.

Granada, a province of Spain forming part of what was the old kingdom of Granada, on the N. coast of the Mediterranean, and E. of Malaga and Cordova, and containing 4,937 square miles. The W. and N. constitute parts of the Sierra Nevada, in which rise the Guadiana menor and the Genil flowing into the Guadalquivir, and the Rio Grande flowing into the Mediterranean. The climate of the valleys and of the coast is genial, and the plains, well irrigated from the times of the Moors downwards, are very fertile, producing wheat, barley, maize, wine, oil, sugar, flax, cotton, silk, and many varieties of fruit. The mining of lead, silver, copper, zinc, and manganese employs many hands. Near the town of Granada are found alabaster, jasper, and other precious stones. Mineral warm springs abound in many places. The principal towns are Granada, Motril, Alhama, Loja, Guadix and Huescar. The town of Granada is situated at the junction of the Darro and the Genil, near the base of the Sierra Nevada, and is built partly in the plain, partly on the slopes. The old town has much that is Moorish, and there are fine squares, as well as a shady walk called the Alameda. The

16th and 17th century cathedral is much ornamented with jasper, and contains the tombs of Ferdinand and Isabella. The church of our Lady has a good high altar and lofty towers. Gonzales de Cordova is buried in the monastery of St. Geronimo. The Carthusian convent contains paintings by Murillo. The climate is pleasant and healthy, but there are few manufactures, and the silk trade, which flourished in the time of the Moors, has well-nigh decayed. Before the conquest in 1492 the Moorish kingdom was very populous, and took in also Malaga and Almeria.

Granadilla, the edible fruit of various species of passion-flower (q.v.) such as *Passiflora quadrangularis*, *P. edulis*, etc. It is somewhat insipid, and occasionally ripens in England.

Granatocrinus, the type genus of the *Granatocrinidae*, is of especial interest to English students, as it includes the commonest English representatives of the extinct class, the Blastoidea (q.v.); most of the European species originally named *Pentremites* belong to this genus. The *Granatocrini* are small globular blastoids with a flat base and are without a stem. The genus is typical of the Devonian and Carboniferous periods.

Granby, JOHN, MARQUIS OF (1721-1770), son of the Duke of Rutland, joined, in 1759, the army sent under Lord George Sackville to aid Prussia. After the battle of Minden the Marquis was made commander-in-chief of the British troops employed in the war. In 1766 he became commander-in-chief of the army at home. He was very popular, though Junius did not spare him from attack.

Gran Canaria, one of the Canary Islands, the capital of which is Las Palmas.

Gran Chaco, a district of South America between lat. 20° and 29° S., partly in Bolivia, partly in the Argentine Republic, and having an area almost twice that of France. The plain inclines S.E., and is in the basin of La Plata, being watered by the Pilcomayo, Vermejo, and other tributaries of the Paraguay. The great rains of the N. cause many marshes and lakes, while the dry steppes of the S. abounding in cactus plants are subject to extensive floods. The district is inhabited chiefly by Indians, and has abundance of forest and pasture, exporting cattle and, of late years, petroleum.

Grand Jury. [JURY.]

Grand Rapids, a city of the United States of America, capital of Kent county in the state of Michigan. It lies on both sides of the Grand river, near the rapids, and 30 miles E. of Lake Michigan. The river is navigable to the city, and there are steamers to Grand Haven and Lake Michigan. The town possesses two public parks, a public library, scientific institute, etc. The river falls 18 feet in 1½ miles, and the resulting water-power is utilised for the industries, of which the chief are furniture-, carriage-, and waggon-making, the manufacture of agricultural implements and machinery, the production of leather, beer and fruit, the making of bricks, and the quarrying of gypsum, which is abundant. Lumbering, too, is largely carried on.

Grandville, otherwise JEAN IGNACE GERARD (1803–1847), a French caricaturist, first gained fame in 1828 by his clever drawings of men with animal's faces, thus satirising most human weaknesses. Other similar works were *Animaux Parlants*, *Cent Proverbes*, *Fleurs Animées*. He also produced some political caricatures, and illustrated La Fontaine, *Robinson Crusoe*, and *Gulliver's Travels*.

Grangemouth, a port of Stirlingshire, 3 miles N.E. of Falkirk, took its rise in 1777, and now has extensive quays, docks, graving-docks, shipyards and warehouses. The latter half of the 19th century has seen an enormous increase in the shipping using the port. The Carron Company have works near by, and maintain a line of passenger steamers between the port and London. The imports consist of timber, hemp, tallow, deals, flax, grain, and iron, and the exports of coal and manufactured iron.

Granger, JAMES (1703–1776), an English print-collector and biographer, was born in Dorset. In 1743 he entered at Christ Church, Oxford, and having taken orders, was made vicar of Shiplake, Oxfordshire, and here he spent the greater part of his life. Among his works were a *Biographical History of England*, *An Apology for the Brute Creation* (sermon), *The Nature and Extent of Industry and Letters*. The custom of cutting out engravings from one book to insert in another is known as "Grangerising" because Granger's history was adapted for this purpose.

Grangers, or "PATRONS OF HUSBANDRY," an American secret society founded in 1867. Its aim is to promote agricultural interests, especially by facilitating the transfer of farm produce and bringing the farmers into more immediate relations with consumers. It is also an educational factor of some importance owing to its libraries and literary entertainments. The organisation consists of a national "grange" with 34 state and numerous local granges. The movement has had much to do with the formation of the "Populist" party, which now predominates in several states of the North-West.

Granite (from the Latin *granum*, a grain), is a rock made up of crystalline granules of orthoclase felspar, quartz, and mica, though often containing oligoclase or other plagioclastic felspar, hornblende, tourmaline, or other accessory minerals. Granite is classed as an *acid* rock, since it contains a percentage of silica, which, though occasionally as low as 58.4, is generally above 60, ranging from 62 to 81. Its chief other chemical constituents, on an average, are alumina 14.8, potash 5.1, soda 2.8, iron peroxide 2.2, and lime 1.6. The orthoclase crystals are sometimes, as in the granite of Shap Fell, several inches long, when the rock is termed *porphyritic-granite*, the plagioclase crystals being generally smaller. The felspars, varying in colour from white to deep pink, determine the colour of the rock as a whole. The quartz commonly fills the spaces between the other minerals and is clear and colourless, or milky from the presence of innumerable minute cavities containing saline water. The mica (q.v.), the least abundant of the

three typical constituents, may be either biotite or muscovite, and appears as small dark plates. The variety in which hornblende partly replaces the mica is called *syenitic granite*, the syenite of Pliny, named from Syene, the modern Assouan (q.v.), where Cleopatra's Needle, which is composed of this rock, was quarried. Another variety, known as *graphic granite*, is strictly a *granulite*, since it contains no mica. It consists of a flesh-coloured orthoclase with plate-like crystals of quartz, presenting in transverse section a striking resemblance to Hebrew letters. Formerly granite was looked upon as the primitive rock of the earth's crust; but it is now certain that some granites are even of Tertiary age. All granites, however, are probably *plutonic*—i.e. have consolidated deep down, under great pressure, though, whilst the rock is often undoubtedly *intrusive*, having been thrust while completely fused into narrow veins, altering the penetrated rock, in other cases it may be looked upon rather as *metamorphic*, passing, as it apparently does, insensibly into gneiss (q.v.), and so into stratified deposits. Granite generally forms rounded hills, but may rise in pinnacles, the *aiguilles* of the Alps. It weathers by the hydration of its felspar into *kaolin* or *china-clay* (q.v.), and this, taking place along the rectangular joints by which the rock is sometimes traversed, gives rise to heaped-up masses of cuboidal blocks, resembling Cyclopean masonry, known as *tors* in Devon and Cornwall. The grey granites of these two counties and of Aberdeen are largely quarried for building purposes, for bridges, sea-walls, kerbstones, etc. The pink granite of Peterhead is especially employed in a polished form for tombs and other ornamental purposes, and the tough syenitic granites of Charnwood Forest, Leicestershire, and of the Channel Islands, are among the best road-metals for macadamised roads.

Grant, a form of conveyance formerly more particularly applicable to incorporeal hereditaments, but now in use for corporeal as well as incorporeal hereditaments. The use of the word "grant" is, however, no longer necessary in any conveyance, the word "convey" being now sufficient in all cases. Where a reversion or remainder was the subject of transfer it was formerly necessary that the tenant of the particular estate should attorn to the grantee, but by a statute passed in the reign of Queen Anne this requisite is now dispensed with.

Grant, SIR ALEXANDER (1826–1884), was born at New York. He came young to England, and then went to the West Indies and, returning to England, went to Harrow in 1839, where he distinguished himself both in and out of school, becoming a member of the Eleven and gaining a Balliol scholarship. In 1849 he was elected Fellow of Oriel, and remained in residence for ten years. He published in 1857 his edition of the *Ethics*, which for long remained a standard book. In 1855 he had been made Examiner for the Indian Civil Service, and from 1860–68 he filled many public educational offices in India. He then

succeeded Sir David Brewster as Principal of Edinburgh University. He did much other classical and literary work.

Grant, CHARLES, LORD GLENELG (1779-1866), was born in India. He was educated at Magdalene College, Cambridge, graduating M.A. in 1804, and writing a prize-poem in 1805. In 1811 he entered Parliament for the Inverness burghs, and afterwards sat for the county till 1835. In 1819 he was Secretary for Ireland, and 1823-27 Vice-President of the Board of Trade. From 1830-34 he was President of the Board of Control, and 1834-39 Colonial Secretary. He then retired, and died at Cannes.

Grant, SIR FRANCIS (1803-1878), a portrait-painter, was born at Edinburgh. He prepared for the Bar, but at 24 turned his attention to painting. In 1843 he exhibited at the Royal Academy, and was very successful in hunting scenes; but he abandoned this line for portrait-painting, and had many celebrities, among them being Scott, Macaulay, Disraeli, Derby, Palmerston, Russell, and Landseer. He became A.R.A. in 1842, R.A. in 1857, P.R.A. in succession to Sir C. Eastlake, in 1866.

Grant, SIR JAMES HOPE, brother of the above Sir Francis (1808-1875), became cornet in the 9th Lancers in 1826. In 1842 he was brigademajor in the China War, and took part in the battle of Sobraon in the first Sikh War. In the Punjab campaign (1848-49) he commanded the 9th Lancers, and was present at Chillianwallah and Gujerat. In the Mutiny he commanded a cavalry division, and had a great part in the relief of Lucknow and the subsequent operations. He was made major-general, commander of the army of pacification, and K.C.B. In 1859 he took part in the China expedition, and was made G.C.B., and after holding various commands at home and abroad became general in 1872.

Grant, JAMES (1822-1887), novelist, was born at Edinburgh, and at 12 years old went to New-foundland. In 1839 he was gazetted ensign in the 62nd Infantry, but did not stay long in the army. His first novel, *Romance of War*, dealt with the Peninsular War, while the next, the *Aide-de-Camp*, illustrated the Calabrian expedition. Other well-known novels are *Frank Hilton*, *Harry Ogilvie*, and the *Highlanders of Glen Ora*. He also published a work on *British Battles*.

Grant, JAMES AUGUSTUS, COLONEL. C.B., F.R.S. (1827-1892), was a native of Nairn. He was educated at the grammar school and at the Marischal College, Aberdeen. In 1846 he entered the Indian army, and was present at Gujerat, and later saw service during the Indian Mutiny. In 1860-63 occurred the noted Speke and Grant expedition to look for the sources of the Nile, and in 1868 he took part in the Abyssinian campaign. He wrote *A Walk across Africa*, *Botany of the Speke and Grant Expedition*, and *Khartoum As I Saw It*.

Grant, ULYSSES S. (1822-1885), an American General, and President of the United States of America, was born at Point Pleasant, Ohio. From

1839-43 he was at the United States Military Academy, and afterwards served in the Mexican War. For a considerable period he was employed in a tannery at Galena, Illinois, but the Civil War of 1861 called him from retirement, and he was made Colonel of the 21st Illinois Infantry. He then became Brigadier-General, and Commander of the district, and fought several battles. At the decisive battle of Shiloh (1862) General Johnston was killed, and in 1863 Grant took Vicksburg. In 1865 he was Commander-in-chief, and at the head of the army of the Potomac, in conjunction with his subordinate generals at the head of other armies, he concentrated his forces upon Richmond, the fall of which ended the war. In 1868 and again in 1872 he was elected President of the United States. There was even a movement for his nomination for a third term, but the plan was abandoned as being contrary to the spirit of the Constitution. Unfortunately he was not careful to check corruption in his subordinates, and there were serious scandals while he was President, though he was not personally implicated. In 1884 a reverse of fortune caused him to undertake a history of the war, and in spite of a fatal and painful illness, which he bore with great fortitude, he accomplished his task.

Grantham, municipal and parliamentary borough and market town of Lincolnshire, is on the Witham, and 22 miles S.W. of Lincoln. The thirteenth-century church, restored by Sir G. Scott, has a spire 274 ft. high, and contains many monuments. Besides the grammar school, founded by Bishop Fox in 1528, there is a guildhall, a town-hall, two exchanges, a literary institute, and a bronze statue of Sir Isaac Newton. The chief industries are malting, tanning, coach-building, agricultural implement-making, and iron-founding.

Grantia, a small simple calcareous sponge belonging to the order Calcarea. It is common round the English coast.

Granulation Tissue, the tissue seen filling up the base of an ulcer, or covering a wounded surface.

Granvella, ANTOINE PERRENOT, CARDINAL (1517-1586), was born in Burgundy, his father being Chancellor of the Empire. In 1540 the son became Bishop of Arras, and in 1560 Secretary of State, and Chancellor in succession to his father. After the abdication of Charles V. he negotiated the marriage of Philip and Mary, and was afterwards Prime Minister to Margaret of Parma in the Netherlands. In 1560 he became Archbishop of Malines, and in 1561 Cardinal. His severity raised great hostility in the Netherlands, and he found it prudent to retire. Later he went to Rome, and was for a time Viceroy of Naples, and he had just been appointed to the see of Besançon when he died.

Granville, GEORGE LEVESON-GOWER, EARL (1815-1891), an English statesman, was educated at Eton and Oxford. In 1836 he became M.P. for Morpeth, and in 1840 for Lichfield. He soon was appointed Under Foreign Secretary, and in 1846 succeeded to the earldom. In 1851 he joined Lord

John Russell's Government, and in 1853 was President of the Council. In 1865 he was appointed Lord Warden of the Cinque Ports, and in 1868 was Colonial Secretary in Mr. Gladstone's first Government. In 1870 he became Foreign Secretary on the death of Lord Clarendon, and in this capacity carried on the negotiations which secured the neutrality of Belgium, and those which arranged with Russia the position which Afghanistan should occupy as between Great Britain and Russia. In 1880 he was again Foreign Secretary, and Colonial Secretary in the short-lived Government of 1886.

Grape. [VINE.]

Grape Animals, a group of Ascidians (q.v.) belonging to the family *Botryllidæ*, so called because they grow in grape-like clusters.

Grape Shot, a mass of spherical bullets, packed together in an open frame of cylindrical shape, fitted for discharge from a gun, and so arranged as to break up soon after leaving the muzzle. In the old sea-service there were always nine balls in a grape-shot, which was then formed in a canvas-bag strongly corded together and quilted with packthread. The weight of the balls varied from 4 lb. for a 42-pounder to 1 lb. for a 12-pounder, and 6 oz. for a 4-pounder.

Grape Sugar. [DEXTROSE.]

Graphic Mathematics signifies the solution of problems in pure or applied mathematics and physics by means of scale drawings. The solutions to algebraic equations may be obtained by drawing the curve represented by the equation that requires solution. [GEOMETRY.] The distances of the points of intersection of the curve with the axis of x from the origin of co-ordinates represent to scale the numerical solutions of the equation. Various surd (q.v.) quantities may be represented by means of the known connection between the three sides of a right-angled triangle. Thus the hypotenuse of that right-angled triangle whose remaining two sides are each 1 inch in length is $\sqrt{2} \times 1$ inch, a length which can be seen by the eye, but cannot be exactly given as a fraction of an inch. The quantity $\sqrt{3}$ is the length of the side of a right-angled triangle whose hypotenuse is 2 inches long and other side 1 inch. Similarly for other simple surd quantities.

The subject includes all processes of determining the composition and resolution of forces, the positions of the mass-centres of various figures, the intensity of stresses in the various members of a given structure, and other dynamical problems, all of which are generally classed together under the head of GRAPHIC STATICS. It is essentially the study of vector- and rotor-addition. The resultant of two forces acting at a point may be determined graphically by the parallelogram of forces, and if at a point three forces are in equilibrium there must be a connection between them which is formulated in the theorem known as the triangle of forces. This is the ordinary basis of solution of the various problems in the practical part of the subject, which frequently admit of simple and elegant solutions by graphical methods where calculation would be difficult.

Graphite, PLUMBAGO, or BLACK LEAD, is a form of carbon (q.v.) which has no connection with lead, save in colour and lustre. It is black, but has a silvery metallic lustre, is unctuous to the touch, soiling the fingers, and has a hardness of 0.5 to 1, and a specific gravity of 1.9 to 2.3. It generally occurs in scales disseminated through limestones, slate, or mica-schist, or in more considerable beds in a massive form, as in the Laurentian rocks (q.v.) of Canada, where the total thickness of the beds is said to exceed that of the coal-seams in the Coal-measures of England. Very rarely it occurs in six-sided crystalline scales, which are believed to belong to the Oblique system. It does so at New Cumnock, in Ayrshire, where its formation is owing to the penetration of a coal-seam by an igneous dyke, and it does so also on the surface of the pigs of inferior or "mottled" cast-iron when too much coal has been added to the ore at the top of the blast furnace. The graphite of Borrowdale, near Keswick, is practically exhausted, and we draw our supplies from Ceylon, Siberia, and Finland, our annual imports being about 14,500 tons, of the value of £192,000. Graphite is used for "black-lead" pencils, for polishing ironwork, so as to protect it from rust, and in the manufacture of crucibles.

Graphitic Acid, the name applied by Brodie to a substance obtained by the action of potassium chlorate and nitric acid upon graphite. It forms small yellow crystals slightly soluble in water. The formula $C_{11}H_4O_5$ has been given to the substance, which has not, however, been well investigated. It appears of interest that neither of the other forms of carbon yield this substance by similar treatment.

Graptotype, a process which was intended to supersede wood engraving, but which only met with a very partial success. The mode of working was as follows:—A plate of zinc was coated with powdered French chalk, subjected to considerable pressure and sized. The drawing was then made by means of finely-powdered charcoal and lamp-black mixed with gelatine and water. The chalk between the lines was afterwards brushed or rubbed away to a depth of $\frac{1}{10}$ th inch or more, the lines remaining owing to the hardening action of the ink employed. From the block so obtained, a mould was taken from which stereotype blocks, etc., were made and used for the printing.

Graptolites, an extinct class of Hydrozoa (q.v.) which lived only in the Cambrian, Ordovician, and Silurian periods. They were all compound animals, and appear to have been always free-swimming. They consisted of two main parts, a numerous series of polypites united by a common flesh or "cœnosarc"; they are represented now by the chitinous skeleton by which they were protected. This consists of the cuplike "hydrothecæ" in which lived the polypites, and a tubular rod upon which these are placed. At the first-formed or proximal end is a small expansion known as the "sacula," which was the original cell, which either persisted during life as a float, or a vesicle for this

purpose is formed from it. The sicula is the earliest known stage in the life history of the graptolites; the next stage is the "virgula," in which a small rod grows up from the sicula; upon this the hydrothecæ are formed, and the graptolite stage is reached. A rod sometimes also grows downward from the sicula, and this is known as the radicle. The rod bearing the hydrothecæ consists of two parts, a solid cord or axis, and a hollow tube on one side of this: this tube or common canal contained the cœnosarc. The reproductive organs of the graptolites are not certainly known, but there is little doubt that certain small cuplike organisms, frequently associated with the graptolites, are the "gonophores" which protected the eggs; similar gonophores occur in the Sertularians (q.v.), which are the nearest living allies of the graptolites. These structures were described as *Dawsonia*, and until they have been found actually united with a graptolite their nature must be regarded as doubtful. The graptolites are classified according to the arrangement of the hydrothecæ on the axis; as a rule they overlap, but in one group—e.g. *Rastrites*—they are loosely scattered. The graptolites with overlapping hydrothecæ are divided into the "Monopriodon" and "Dipriodon" groups: in the former the hydrothecæ are placed on one side only of the axis, as in *Monograptus*, *Tetragraptus*, etc., while in the other they are placed on both sides, as in *Diplograptus*. In one family they occur on each side of an expanded plate, giving the colony a leaf-like form: such are known as the *Phyllograptidæ*.

Grasmere, a village in Westmoreland, half a mile north of the lake of the same name, which is celebrated for its beauty, and about 4 miles N.W. of Ambleside. The church is that described in the *Excursion*. Wordsworth and Hartley Coleridge are buried in the churchyard.

Grass-cloth. [Bœhméria.]

Grasse, HENRI, COMTE DE, French admiral, was born at Valettes, Provence, in 1723, and is best known as having been the adversary of Hood, off Martinique, 1781, of Graves in Lynn Haven Bay in the same year, and of Rodney off St. Christopher, and again off Martinique in 1782. He died in 1788.

Grasses, a large group of monocotyledonous plants constituting the natural order *Gramineæ*, and comprising about 4,500 species in about 250 genera. The term is popularly used for many green herbaceous plants which are not members of this order, the limits of which were first suggested by the classification of Linnæus (q.v.), in which most true grasses appear under the order Digynia of the class Triandria, having two styles and three stamens. Grasses occur in all climates, those of temperate regions being generally herbaceous and "social," i.e. growing together in great numbers and considerable variety, and so forming "pastures," whilst in warmer countries they are often in tufts or arborescent, some bamboos (q.v.) having 50 or 60, or even upwards of 100 stems. The roots are fibrous and the stems generally cylindric, with

swollen nodes and hollow and elongated internodes, though the sugar-cane (q.v.) has short and solid internodes. The perennial forms have commonly creeping rhizomes, with solid internodes, from which the erect aerial branches or culms (q.v.), often themselves branched, grow with great rapidity, a bamboo even reaching 100 feet in two months. The culm secretes a large amount of silica in its epidermal cells, and becomes hard and polished externally. The leaves are distichous, have a long sheath forming a generally split tube embracing the internode, seldom with any petiole, but with a membranous outgrowth, or *ligule*, at the base of the long, narrow, linear, tapering blade. The flowers are very variously grouped in racemes or panicles of small spikes, or *spikelets*, and are generally bi-sexual, though maize and some of the arborescent forms are monœcious. Each spikelet has generally two *empty glumes* (q.v.) at its base, and may contain one, two, or many flowers besides other empty glumes or "barren flowers." Below each flower there are usually two glumes at different levels, belonging, in fact, to distinct axes. The lower of these, the *flowering glume*, is often furnished with an *awn* (q.v.) either at its apex or springing from it dorsally, which represents the blade of a leaf. The upper glume or *pale* is membranous, and has two lateral veins and no midrib, representing two united bracteoles. It is close below the flower. The outer perianth-whorl is almost always suppressed, and the inner one represented by two minute hypogynous scales known as *lodicules*. There are three of them in bamboos, and six in *Streptochaete*. There are usually three stamens alternating with the lodicules, and belonging, therefore, to an outer whorl; but in rice (q.v.) and most bamboos there are six, in two whorls, and sometimes more, or only two or even one. They are commonly exserted, with long weak filaments and pendulous versatile anthers with lobes diverging at each end. The gynæceum consists typically of two carpels united into a one-chambered ovary with two distinct styles and feathery stigmas, the flowers being commonly wind-pollinated. In a few cases there is only one style, which in maize (q.v.) reaches a length of six inches, and in some bamboos there are three. In all cases there is but one ovule, which generally entirely fills the ovary. The fruit or *caryopsis* is commonly deeply grooved down the line of junction of its carpels and is very rarely fleshy. In *Coix laachryma* it is enclosed by a strong white polished bract or involucre, whence it has the name of "Job's tears." The seed is mainly filled with mealy endosperm, the embryo lying at one side of its base.

The value of grasses depends primarily on their farinaceous fruit or "cereal grains," the chief bread-stuffs and staple food of the world; secondly, on the use of their herbage, either green or as hay for fodder for cattle; thirdly, on the sugar of their sap. The chief cereals, wheat, rice, maize, barley, oats, rye, and millet, are dealt with in separate articles (q.v.). Among the chief fodder-grasses are rye-grass (*Lolium*), Timothy-grass (*Phleum*), *Cynosurus* and *Anthoxanthum*; and the tussac-grass, *Festuca flabelloides* of the Falkland Islands.

Besides the sugar-cane (q.v.), sugar is obtained from various species of *Sorghum*. The Esparto-grass, *Macrochloa tenacissima*, and Alfalfa, *Lygeum spartum*, are both used as paper materials, as also is the straw of the cereals and the bamboos. whilst the latter group have endless uses as a light strong timber. Finally the fragrant oils of geranium, ginger-grass, obtained from East Indian species of *Andropogon*, must be mentioned.

Grasshopper, a group of insects belonging to the order Orthoptera (q.v.). They are represented in England by two families, the *Locustidæ* and the *Gryllidæ*. The commonest and most familiar forms are the small green grasshoppers belonging to the *Locustidæ*; the commonest English species is *Rhammaticerus biguttulus* (Linn.). This family is characterised by the length of the antennæ or feelers, and by having four joints in the tarsal portion of the leg. The *Gryllidæ* are as a rule larger than the *Locustidæ*; thus one English species, the great green grasshopper (*Phasgonura viridissima*, Linn.) measures 4 inches in expanse of wing; the members of this family all possess an ovipositor—a sharp tube by means of which it deposits its eggs in a suitable nidus. Most of the grasshoppers can make a slight chirping noise, but in some of the *Gryllidæ* this attains a high degree of development: thus some of the Brazilian species (e.g. *Chloroscelus tanana*) are kept in cages on account of their song.

Grass Moths, a family of Microlepidoptera known as the Crambidæ; they live in meadows, spending most of their time hidden in the grass. As their wings are compactly folded into a kind of tube, they are very small when at rest, but appear comparatively large when the wings are expanded in flight.

Grass Oil, a name given to the volatile oil obtained from various plants, and distinguished further as ginger grass oil, Turkish grass oil, etc. Many varieties are known, differing in their uses and chemical composition, and employed for various purposes in medicine, for cosmetics, perfumery, etc.

Grass-tree, a name applied in Australia to the various species of the liliaceous genus *Xanthorrhæa*. They have thick palm-like stems, which when blackened by bush-fires give the plants the name of Black-boys, and a dense terminal tuft of long grass-like leaves that furnish good fodder. The stems exude abundance of fragrant resin, either yellow Botany Bay or Acaroid resin, or red Black-boy gum. From them also picric acid (q.v.) is obtained. The similar juncaceous plant *Kingia australis* is known by the same name.

Grate. It is of importance in the combustion of coal for heating purposes that the furnace should be properly constructed so as to fulfil the special objects for which the furnace is required. In the ordinary fireplaces required for the warming of houses, it is customary to have grates of about 24 inches in width and 6 inches in height placed close to the floor so that the requisite draught to the fire may be low-lying, and so that there may be

less danger of accidents by fire. The draught is very slight, just sufficient to induce a continual upward current of burnt gases through the chimney and to effect a slow and steady combustion of the fuel. When the fuel is incandescent it is desirable that it shall be burnt away as slowly as possible, for there is then less waste by convection of hot gases up the chimney and more radiation of heat into the room. Kitchen ranges require the heat to be localised to a greater extent, and the grate is therefore much closer. Also, it is usual to conduct the hot gases past the ovens so that part of their heat may be utilised. In engineering the design of grates for steam boilers is of much importance. It is necessary that the area of the grate shall be carefully estimated. This is obtained from determinations of the amount of water that has to be converted into steam per hour. It also depends upon the shape of the boiler and its flues, and in fact the area of fire-grate is usually approximated by comparison with already-existing examples that are working well. The number of pounds of coal burnt per square foot of fire-grate per hour varies from about 4 in large Cornish boilers to 140 in locomotives. Such grates as these consist of parallel fire-bars about 3 feet in length supported on cross-bars, the whole forming an area about 6 feet in length and from 15 to 50 inches in width.

Gratianus, AUGUSTUS (359–383), Roman Emperor, son of Valentinian I., was born at Sirmium in Pannonia. While still a child he accompanied his father in a campaign against the Alemanni. On his death in 375, he became ruler over the Western Empire in conjunction with his younger brother, Valentinian II., Gaul, Spain, and Britain being allotted to Gratian. The early part of his reign was occupied with wars against the Alemanni and other barbarians. In 378 he succeeded his uncle Valens (q.v.) as ruler of the Eastern Empire, but gave a share in the sovereignty to Theodosius (q.v.). Gratian's private character was estimable, and his hostility to paganism secured the favour of the Church, but his luxurious habits made him unpopular with the army. Maximus was proclaimed emperor by the legion in Britain, and, after a defeat near Paris, Gratian fled to Lyons, where he was slain by one of his adversary's adherents.

Gratings, in experimental *Optics*, are plates of glass or speculum metal on which are ruled parallel lines equidistant from each other, and sufficiently close to form diffraction spectra of the light that passes through or is reflected from the grating. By means of such diffraction gratings the wave-lengths of light of different colours have been most accurately determined. For ordinary purposes 10,000 lines to the inch will suffice, but for more accurate work double that number are desirable. The process of ruling these lines was well elaborated by Nobert, but has been much improved by Professor Rowland, who has succeeded in ruling over 40,000 lines to the inch. The process of ruling depends upon the action of a well-made screw, which takes months to make. Rotation of this produces motion of a cutting diamond, which is

thus moved onwards slightly, after cutting each furrow in the glass or metal. The grating may be spoilt by wearing down of the cutting point, which will then produce more than one furrow at a time. The lines will be scratchy if the point is too hard, and the avoidance of such practical difficulties as these may render a search after suitable diamonds one of months' duration. It takes five days and nights to rule a six-inch grating with 20,000 lines to the inch. Fairly good gratings may be produced by photography, which readily provides the means of obtaining diminished copies on glass of equidistant parallel lines.

Grattan, HENRY (1746-1820), the Irish patriot and orator, was born in 1746. After an education at Trinity College, Dublin, where he became an accomplished classical scholar, Grattan, at the age of twenty-one, entered the Middle Temple, and in 1772 was called to the Irish Bar. In 1775, in consequence of Flood's recommendation to the Earl of Charlemont, he was returned to the Irish Parliament as member for the borough of Charlemont, and rapidly acquired the popularity and influence which were now withdrawn from Flood. The fortunes of Irish commerce were then at a low ebb, mainly owing to the restrictions on exportation imposed by the English Parliament, and the agitation for their removal became so formidable that in 1780 Lord North was compelled to abandon the greater number. Grattan now became the champion of legislative freedom, and in 1780 delivered the famous speech in which he maintained that the Crown is competent to legislate for Ireland with the co-operation of the Irish Parliament alone. The Convention of Dungannon in February, 1782, was followed two months later by concessions on the part of the Rockingham Ministry, through which the legislative independence of Ireland was secured. Grattan received a grant of £50,000 from the Irish Parliament, but Flood and his adherents were dissatisfied with the character of the surrender, and a very bitter feeling was engendered between the two leaders. "Grattan's Parliament" did not realise the aspirations of its author, owing to its unrepresentative character and the corruption rife among its members, yet he gave but a cold support to Flood's agitation for parliamentary reform, confining his own efforts, for the most part, to the struggle for Catholic Emancipation. However, he brought forward a Place and Pension Bill, a bill debarring revenue officials from voting at elections, and others of the same character, but they were all thrown out. A bill, introduced by Secretary Orde, establishing complete freedom of trade, was passed by the Irish Parliament, but in the English House of Commons its operation was limited by the enforcement of the Navigation Laws in Ireland and other restrictions which were very distasteful to Grattan and his compatriots. Pitt was accordingly obliged to abandon the project. Just before the rebellion of 1798 broke out Grattan retired from public life, but in 1800 he returned as member for Wicklow, and resolutely opposed the bill for the Union. After it was passed he again withdrew from politics, but

in 1805 he was returned to the Imperial Parliament as member for Malton in Yorkshire, and in 1806 became member for Dublin. The rest of his life was devoted to the cause of Catholic Emancipation, his support of which was none the less keen because he himself was a Protestant. His death occurred in 1820. He was buried in Westminster Abbey, by the side of his friend Fox. The private and public character of Grattan were alike free from reproach, and his parliamentary eloquence entitles him to rank among the foremost orators of the age.

Gratz, or GRAZ, the capital of Styria in Austria, is picturesquely situated on the river Mur, 141 miles S.S.W. of Vienna by rail. On a steep hill in the centre of the town stand the remains of the citadel, which was destroyed by the French in 1809. Within the town there are many ancient buildings, including a cathedral which dates from 1462, the castle of the Dukes of Styria, the Landhaus where the nobles of the Duchy assembled, and a university, founded in 1586, which has a library of 120,000 volumes. The Johanneum, or technical school, was established in 1812. The chief industry is the manufacture of steel and iron goods; wine, sugar, and perfumery are also articles of trade.

Gravel. [CALCULUS.]

Gravel, an uncemented fragmentary rock made up of subangular water-worn fragments, generally siliceous and often mixed with sand, and stained of a yellow-brown by iron-oxide. Gravels may be of marine origin, but have then generally a more rounded character and pass into shingle (q.v.), or may be the marine matter of a glacier (q.v.) as in eskers; but most gravels are formed by rivers and are of modern (Pleistocene) age. Owing to successive diminutions in the streams, accompanied apparently with an intermittent uprise of the land, these gravels and other alluvial deposits have frequently been cut into terraces by the rivers. [RIVER-TERRACES.] Of these there are in Britain generally three, known as the High-level, Middle-terrace, and Low-level gravels, of which the lowest belongs to the Historical period, whilst the others contain pre-historic remains.

Gravelines, a small French seaport, in the department of the Nord, 13 miles E.N.E. of Calais. The population is rapidly diminishing. The French army was here defeated by the Flemish under Count d'Egmont in 1558. The town was fortified by Vauban.

Graves, THOMAS GRAVES, first LORD, a distinguished British admiral, was second son of Rear-Admiral Thomas Graves, of Thancks, Cornwall, and was born in 1725. He served under his father at the attack on Cartagena by Admiral Vernon, and in the *Romney*, 50, in the action of February, 1743, as well as in Anson's victory and Hawke's victory in 1747. Promoted to be captain in 1755, he acted with vigour against the privateers until he was made Governor of Newfoundland, in which position he drove off the French under M. de Ternay. In 1779 he reached flag-rank, and in 1781

fought a gallant but indecisive action with the Comte de Grasse in Lynn Haven Bay. On his way home, in the following year, his flagship, the *Ramillies*, 74, suffered so severely that she had to be abandoned and destroyed, and several other vessels of the fleet were lost, owing to the frightful nature of the weather encountered. He was afterwards port-admiral at Portsmouth, and in 1794, under Earl Howe, was second in command at the great victory of June 1st, and was severely wounded. He was rewarded with an Irish peerage. He died an Admiral of the White in 1802.

Graves' Disease, BASEDOW'S DISEASE, EXOPHTHALMIC GOITRE (Gk. *ex*, out, *ophthalmos*, eye), a disease of which palpitation, enlargement of the thyroid gland, and protrusion of the eyeballs are the associated characteristic symptoms. This malady usually occurs in young adult women. Its cause is obscure, but is supposed to be in some way connected with disease of the cervical sympathetic nerves. The first symptom to appear is usually palpitation. As a rule, the prominence of the eyeballs is noticed before the enlargement of the thyroid gland. The disease is not uncommonly accompanied by morbid structural changes in the valves of the heart. Exophthalmic goitre is not in itself, as a rule, a fatal malady.

Gravesend, a port and borough in Kent, on the south side of the Thames, 24 miles E.S.E. of London. It consists of an old and a new town, the latter of which contains some handsome buildings. Market-gardens abound in the neighbourhood, and the inhabitants are much engaged in fishing, ship-building, and the supply of ships' stores. Gravesend is a favourite resort of Londoners during the summer season. It is mentioned as a harbour in Domesday, and was incorporated under Elizabeth. It now returns one member to Parliament.

Gravière, JEAN PIERRE EDMOND JURIEN DE LA, French seaman and historian, was born at Brest in 1812, entered the navy in 1828, and became a captain in 1850, a rear-admiral in 1855, and a vice-admiral in 1862. Besides seeing some war service, he was for many years vice-president of the Higher Commission of Naval Archives. His leanings, indeed, were chiefly historical, and his works on naval history gained him election in 1888 to the Académie Française. He died in 1892.

Gravimetric Analysis. Quantitative analysis—i.e. the determination of the amounts of the several known constituents present in a compound substance or mixture of substances—may be divided into two great branches, volumetric and gravimetric analysis. In the latter the determination is made by converting the particular constituent which is to be determined into some form of combination, the composition of which is accurately known, which can be obtained pure from the original substance, and the weight of which can be accurately determined. Thus, suppose it were required to determine the quantity of *e.g.* sulphuric acid combined with metals in a sulphate, a known weight of the substance would be dissolved in dilute hydrochloric acid and a solution of

barium chloride, BaCl_2 , added. By this means a white precipitate of sulphate of barium is obtained, which can be collected on a filter paper, dried, and heated strongly, so that no moisture remains, and the paper is completely burnt. As the resulting mass contains 41.2 per cent. of SO_4 , or corresponds to 42.1 per cent. of sulphuric acid, the quantity of this acid in the original body is easily determined.

Gravina, FREDERICO DE, Spanish admiral, was born in 1747. After much honourable service he attained flag-rank, and in 1793 co-operated with the English in the operations against Toulon, where he was wounded. In 1797 he was in command of a division at Cadiz when that place was bombarded by Nelson, and in 1805 he was deputed to conclude in Paris the secret treaty which led to the junction of the Spanish and French fleets in that year. He commanded in the consequent action with Sir Robert Calder, and was in command of the Spanish contingent at the battle of Trafalgar, where he received a wound of which he died in the following year.

Gravitation. From the earliest infancy of mankind and man the existence of an attraction of all bodies towards the earth has been experienced. The mode of action of this force was first stated by Newton, who enunciated the law of gravitation, that "every particle of matter in the universe attracts every other particle with a force in the direction of a straight line joining the two, whose magnitude is proportional to the product of the masses, and inversely proportional to the square of the distance between them." In more recent times it has been shown that similar laws hold for the attraction of unlike magnetic poles and for quantities of opposite kinds of electricity. Newton was enabled by his hypothesis to explain the motions of the moon round the earth and of the various planets round the sun. Given a planet moving in a definite direction at a certain instant, its motion relatively to the sun may be proved to be in an ellipse with the sun at one focus, if the mutual gravitational force between them be inversely proportional to the square of their distances apart. This is the first of Kepler's laws of planetary motion, which were deduced from observation by that astronomer before Newton's law had been formulated. Kepler's second law states that the line joining the sun and any planet sweeps out equal areas in equal intervals of time. This is not an experimental proof of Newton's law of inverse squares, for it holds good whenever the attraction is towards a fixed centre, whatever variation there may be in the intensity of that attraction. The third law is that the square of the periodic time or the time taken for the planet to complete a revolution round the sun is proportional to the cube of the major axis of the ellipse, and this again depends upon the accuracy of Newton's hypothesis.

Kepler's laws are only approximately true. The heavenly bodies are subject to certain perturbations which have been accurately measured, and which have been shown to be caused by the small gravitational forces existing between each body and the others. It was by means of such observed

irregularities in the motion of Uranus that Adams proved the existence of another planet still farther distant from the sun, and also calculated its position. Attention being directed to that portion of the heavens, Neptune was discovered, and another experimental proof of Newton's law of gravitation added to the many already existing.

A homogeneous sphere of matter will attract any external particle with a resultant force acting through the centre of the sphere, identical with that which would act on it if all the mass of the sphere were concentrated at its centre. If the sphere acts, not on a single particle, but on any irregular mass of particles, inasmuch as the force on each particle acts through the centre of the sphere the resultant force will also pass through the centre. So also will act a hollow sphere if perfectly homogeneous, whatever be its density, and hence also a sphere whose density is uniform at all points equidistant from the centre, for such a sphere may be regarded as being built up of concentric homogeneous layers. The earth approximately satisfies this condition, for, although it is not of equal density throughout its mass, its density is approximately uniform at equal distances from its centre. Hence the earth attracts all external bodies with a force of gravity passing through its centre. If it act on another sphere satisfying the same conditions the mutual force of gravity would be along the line joining the two centres, and will be identical with the force that would act between two particles placed at those two centres, whose masses are those of the earth and of the external body. Most of the heavenly bodies satisfy approximately this condition, and the calculations of gravitational effects are much simplified by the assumption of its correctness. Yet it must be remembered that the earth is, strictly speaking, a spheroid, and the irregularity of the attraction of the sun and moon on account of this eccentricity from the perfect sphere gives rise to the phenomena of *precession* (q.v.) and *nutation* (q.v.). With all small bodies there is a fixed point through which the force of gravity passes whatever be the aspect of the body towards the earth. This point is called its *centre of gravity* (q.v.), but, strictly speaking, there is no fixed point in any irregularly-shaped body that can properly be called its centre of gravity, such a point existing only for certain symmetrical distributions of matter that are termed *centrobaric*, an example of which is the homogeneous sphere just referred to.

The intensity of the force of gravity at any point is measured by the acceleration produced on any body free to move under the action of that force only. If the mass be increased the total force of gravity is proportionately increased, and the acceleration produced is the same. It is therefore independent of the mass of the body, and a piece of lead of any mass would have the same acceleration as a feather of any mass. Air-friction is observed to retard the one more than the other, but it is assumed above that the force of gravity shall be the only one acting, and the accelerations must therefore be observed in *vacuo*. But for accurate estimations it is desirable to use some indirect

means of measuring the intensity of gravity rather than of determining it by direct measurement of this acceleration. The periodic time of oscillation of a pendulum at any spot depends upon its dimensions and the intensity of the earth's gravitation (which is generally denoted g), and since pendulum experiments may be made with accuracy they are frequently employed in the determination of g .

The value of g in the British Islands is about 32.2 in foot-second units, *i.e.* a speed of 32.2 feet per second is acquired in a second. It varies from 32.091 at the equator to 32.255 at the poles, the body gaining weight as it moves from low to high latitudes. The value given for the equator is that of gravity diminished by the centrifugal force which tends to throw the body outwards, but if the effects of centrifugal force are eliminated it will still be found that at the poles the attraction is greater, for the distance of the body from the centre of the earth is less there than at the equator.

Various theories have been put forward to account for gravitational attraction, the chief being due to Newton, Le Sage, Lord Kelvin, and Clerk Maxwell, but these are scarcely more than suggestions, and are all open to serious objections.

Gray, a French town, on the Saône, in the department of Haute-Saône. It preserves the remains of an ancient castle inhabited by the Dukes of Burgundy, and has a trade in corn, timber, and iron.

Gray, ASA (1810–1888), a distinguished American botanist, was born at Paris in the state of New York. He studied under Professor Torrey, and in 1842 was appointed Professor of Natural History at Harvard. In 1874 he became regent of the Smithsonian Institution. He was influential in introducing a more natural system of classification in the science of botany, and did much to extend the views of Darwin in America. His chief work was his *Genera Floræ Americæ Boreali-Orientalis Illustrata* (1848–50).

Gray, DAVID (1838–1861), a Scotch poet, born at Duntiblae, on the Luggie, near Glasgow. His father, a poor weaver, sent him to the university of Glasgow in the hope that he would enter the ministry; but Gray, feeling that literature was his true vocation, came to London with Robert Buchanan in 1860. In spite of the kindly encouragement of Monckton Milnes (afterwards Lord Houghton), he was bitterly disappointed at his ill success. Falling into a consumption, he returned to his parents' home near Kirkintilloch, where he died. His *Luggie and Other Poems* was published, with a memoir by James Hedderwick and a prefatory notice by Monckton Milnes, in 1862.

Gray, ELISHA (b. 1835), an American inventor, who has introduced various improvements in the construction of the telephone and the multiplex telegraph.

Gray, JOHN EDWARD (1800–1875), a naturalist, born at Walsall, was keeper of the zoological collections in the British Museum from 1840 to 1874. He drew up catalogues of these collections,

with valuable annotations, and published *Illustrations of Indian Zoology* (1830-35), and other works.

Gray, THOMAS, was born at Cornhill on the 26th December, 1716. His father, a man of strange temper, refused to educate him, and he was sent by his mother to Eton, where he formed a lifelong friendship with Horace Walpole. He afterwards proceeded to Peterhouse, Cambridge, but left the University without a degree. He then travelled for two years on the Continent with Walpole, at the latter's expense. On his return he began to read for the Bar, but finding, when his father died, that the cost would embarrass his mother, he returned to Peterhouse in 1742, and ever afterwards led the life of a studious recluse. Earlier in the same year he paid his first visit to Stoke Pogis in Buckinghamshire, a place at which he settled his mother with two of her sisters, and which is associated with much of his poetry. At this time he wrote there his *Ode to Spring*, and the *Ode on a Distant Prospect of Eton College*, and began the *Elegy Written in a Country Churchyard*, which, probably retouched in 1749, was not finished until 1750, when he sent it to Walpole. It was published in the following year, and at once raised Gray to a foremost place among English poets. In his private life it brought him a friendship with Lady Cobham and her niece, Harriet Speed, but the conjectures of his friends that the younger lady would become his wife were not fulfilled. In 1756 a practical joke of some undergraduates caused him to remove from Peterhouse to Pembroke Hall, which he made his home for the rest of his life, with the exception of three years (1759-1762) which he spent in London in order to be near the British Museum. In 1757 he published two odes in imitation of Pindar, *The Progress of Poesy* and *The Bard*, which marked an important step in the development of English lyrical poetry. At the end of this year, on the death of Cibber, he was offered the laureateship, which he declined. His last publication was in 1768, when he brought out some paraphrases from Icelandic and Gaelic sources. In the same year he was appointed Professor of Modern Literature and Modern Languages at Cambridge. His health, however, always weak, soon gave way, and he died on the 30th July, 1771.

The true biography of Gray is in his letters. They show playful gleams of the brightest fancy, a warmth of affection for his dearest friends, a student's interest in literature, and a love for nature, which, on the one hand, led him to fill his window-seat with mignonette, and, on the other, to anticipate the feeling of the present century for the grander aspects of mountain scenery. They afford an insight into the slow working of a genius which sought perfection of form in its slightest utterance, and they reveal an industry and a lack of ambition which make his story a record of abandoned projects. As much a scholar as a poet, he prepared the greater part of editions, which never saw the light, of Strabo, Plato, and the Greek Anthology, and of a History of English Poetry, while he left unfinished fragments of a Latin poem on the philosophy of Locke, and of one in English on *The Alliance of*

Education and Government. It may, however, be said that, in whatever he finished, he attained the perfection which he sought. In a certain profound melancholy and depth of insight he stood nearer to the present generation than to his own; but, except for his *Elegy*, he is not likely ever to be popular. He is the poet of the poet and the scholar, not of the man of the street.

Grayling, any fish of the genus *Thymallus*, with five species from the northern rivers of both hemispheres, chiefly distinguished from *Coregonus* (q.v.) by their long many-rayed dorsal, violet in colour with dark spots. *T. vulgaris*, the European grayling, is British; large specimens attain a length of ten inches. The general colour is silvery grey, with dark stripes from head to tail. *T. signifer* is known in Canada as *poisson bleu* (= blue-fish).

Grayling (*Hipparchia semele*, Linn.), a large English butterfly about $2\frac{1}{2}$ inches in expanse of wing, which is common on hill-sides and heaths in limestone districts.

Grease consists of a very impure mixture of fatty and oily matters, with a consistency somewhat like that of butter. It is largely employed as a lubricant for heavy machinery and axles of wheels, but is not employed for any delicate machinery.

Great Basin, a desert plateau in the west of the United States, comprising most of Nevada and part of Utah, California, Oregon, and Idaho. It is triangular, the northern boundary, 500 miles in length, forming the base, and the Wahsatch Mountains and the Sierra Nevada skirting the eastern and western sides respectively. The distance from north to south is about 800 miles. It is crossed by several mountain ranges, and abounds in streams, most of which flow either into the Great Salt Lake or into Carson Lake. These and the other salt lakes on the plateau are either evaporated or lost in the sand. There is little vegetation.

Great Circle of a sphere is a curve determined on its surface by any plane passing through its centre. It is the greatest circle that can be drawn on the surface of the sphere; all others are similarly produced by plane sections, but are of smaller size. The shortest line drawn along the surface connecting any two points on it is an arc of the great circle passing through them. Hence the importance of great circle sailing in navigation. [SPHERE.]

Great Fish River. (1) A river in Cape Colony, which rises in the Sneeuwberg Mountains. (2) A river of British North America, known also as the Back River, which flows into the Arctic Ocean.

Great Kanawha, a tributary of the Ohio, which rises in the Blue Ridge in North Carolina.

Great Powers, the greater civilised States, usually applied to England, France, the German and Austrian Empires, Italy, Russia, and (sometimes) Spain. The United States doubtless deserves inclusion, but hitherto has taken little part in European politics. The phrase is usually applied in connection with the Eastern Question (q.v.).

Greatrakes, VALENTINE (b. 1628), was born at Lismore in Ireland. Soon after the Restoration he began to touch for the "king's evil," ague, and other maladies. Robert Boyle, Henry More, and others testified to the genuineness of his cures. He professed to be divinely gifted.

Great Salt Lake, in Utah, extends along the western side of the Wahsatch Mountains. It is about 80 miles in length, from 20 to 32 in breadth, and is 4,200 feet above the sea-level. It is very shallow and is destitute of fish, but contains insects of various kinds. There are several islands in the lake, one of which, Antelope Island, has a length of 18 miles. The lake has several tributaries but no outlet, the waters disappearing through evaporation.

Grebe, any bird of the cosmopolitan genus *Podiceps*, with 26 species, the type of a family *Podicipedidæ*. Grebes are diving birds that frequent fresh water during the greater part of the year, only resorting to the sea in winter, and rarely going far from water, for the lobed feet are placed so far back as to be poor organs of locomotion on land, though they are admirably fitted for swimming organs, and by their means alone these birds dive and move under water. The general plumage is blackish-brown above, and glossy white, tinged with rust-red or grey at the sides, beneath. There is generally some rust-red on the crest, which is less developed in the female than in her mate. The flesh is uneatable, but the skins are valuable for muffs and trimmings. The Great Crested Grebe (*P. cristatus*), about 21 inches long, is resident in many parts of Britain, but is not nearly so common as the Little Grebe or Dabchick (*P. fluvialis*), about 9½ inches long, and without a crest. The Red-necked Grebe (*P. griseigena*), about 17 inches long, and the Horned or Slavonian Grebe (*P. auritus*), are autumn and winter visitants, the latter chiefly to waters of the eastern counties. The Eared or Black-necked Grebe (*P. nigricollis*), our rarest visitor, comes in spring and summer.

Grebos (KREBOS), a Negro people of West Africa, whose territory lies on both sides of Cape Palmas, being coterminous on the west with the Segleo and Bitao (Grand and Little Sess), and on the east with the Nyambo district. The Grebos are the Fish Kru of English writers, and are closely related to the well-known Kroomen of the Guinea Coast. (Dr. Baikie, *Voyage up the Kwora*; Captain Allen, *Expedition to the Niger*, vol. i.)

Greece. *Physical Features.* This country, lying in lat. 35° 40' to 40° 10' N., and long. 18° 20' to 25° 50' E., has undergone many changes in extent. During the early period of its history its limits depended rather on the nationality of its people than on precise territorial divisions. The boundaries of the modern kingdom were fixed in 1832 by a treaty between Great Britain, France, Russia, and Turkey. On the north the line was drawn from the Gulf of Arta along the Othrys range to the Gulf of Volo. In 1864 Great Britain added the Ionian Islands, and in 1881, in consequence of a clause in the Treaty of Berlin (1878), some 5,000

square miles north of the boundary of 1832 were given over by Turkey. The new boundary runs in a S.W. direction from a point on the Gulf of Saloniki. The area of the country is about 25,000 square miles, of which the surface is so completely intersected by mountains that it presents an unusual variety of climate, enabling a traveller, between the plains and high ground, to pass in a journey of fifty miles through the seasons of spring, summer, and winter. The sharp dividing-lines thus created between various districts have led to great differences in the character of the inhabitants, and were largely the cause of the disunion which was fatal to the country in the classical period. The coast is much indented, and with the adjacent islands affords every facility for commerce. At the time of the Turkish dominion the mountains sheltered bands of "Klephts," half-patriots, half-brigands, and often the inlets and islands have sent out pirates to sweep the seas with organised fleets. None of the mountains are active volcanoes, and none are covered with perpetual snow, but many of them reach the height of seven or eight thousand feet. The rivers are short, rapid, and not navigable; marshes and small lakes are common, and there are hot springs at Thermopylæ and other places, which are used for medicinal purposes. Among the minerals are gold in small quantities, silver, copper, coal, iron, lead, antimony, and manganese. Marbles of different classes are largely quarried.

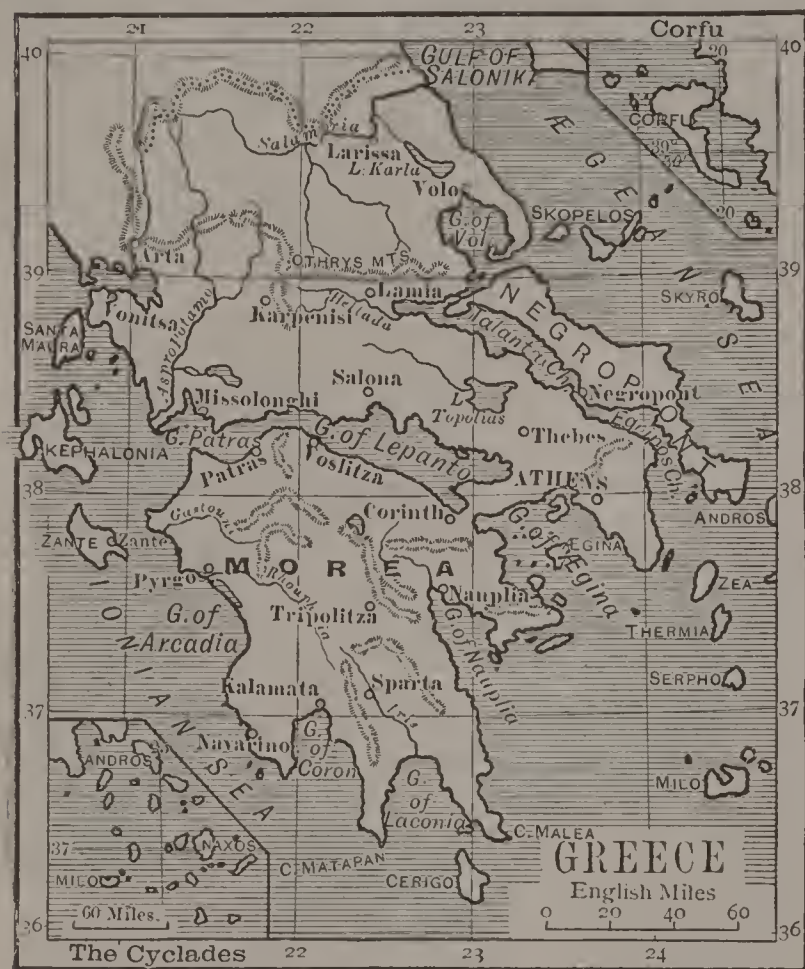
Productions. Exports and imports. Agriculture is backward. Much attention is paid to the cultivation and exportation of currants, oranges, lemons, almonds, pomegranates, wines, olive oil, and valonia bark. Silk, cotton, tobacco, and sponges are also exported. The chief imports are of cereals, cattle, and manufactured articles. The national finances are seriously embarrassed.

Army and Navy. Justice. The standing army consists of about 28,000, but all citizens are obliged to undergo training, and are liable for service up to the age of fifty. The navy contains only a few ironclads. In the administration of justice the jury system is adopted; the supreme court bears the classical name of the Areopagus.

Religion. In classical times paganism was the universal faith; to express doubt in it was to incur the enmity of the populace. Zeus was the highest god, but his will was subject to fate. Various deities had special worship in different places. The temple of Apollo at Delos was the centre of Ionic-speaking Greeks; his oracle at Delphi became a Panhellenic authority; Pallas Athene had Athens under her own protection. When Christianity swept away the old religion, a church grew up which supplied, to some extent, in its administration, the lack of political freedom. It became identified with the national life, so that to be a Greek has been for many centuries to be a member of the Greek Church (q.v.)

History. We have seen that the physical peculiarities of the country tended to make a number of independent communities. To such an extent was this the case that the city became the recognised political unit. The state, said Aristotle, would not be a state if it consisted "of ten men

or of ten times ten thousand." It must be of a moderate size, to allow the electors an acquaintance with the citizens whom they could choose for rulers, and the judges a knowledge of those whose causes they would have to decide. The origin of these tiny communities is lost in myth. In the imagination of the people the founders were heroes, the sons of gods, and legend took the place of record. Our earliest insight, not into events but into the state of society, is given by the Homeric poems. Each band of warriors had its king,



MAP OF GREECE.

practically supreme, but assisted by a council of elders and by an assembly of all his male subjects. These bodies were merely deliberative, and had little or no legislative power. Women, in later times kept in seclusion, then came freely forward. Hospitality was a cardinal virtue. Definite professions were already followed; a man was a bard, a leech, a carpenter, or a prophet.

Out of this society were developed the Hellenic States of history. In spite of differences, they were bound together internally by a fellowship in blood, in language, in habits, and in ways of thinking, and externally by common worship at certain shrines. To guard the temple of Apollo, who interpreted the will of Zeus at Delphi, an Amphictyonic league was formed. Twelve "races" of Hellenes sent representatives to its meetings, and during the early period its political influence was undoubtedly great. Other leagues, of less importance, among neighbouring cities acted also as unifying influences, but to a less degree than the great Panhellenic festivals of the Olympic, Isthmian, Pythian, and Nemean games, which afforded opportunities of friendly meeting even to members of belligerent states. The Olympic festival, held every four years,

formed a calendar of "Olympiads," of which the first was dated in 776 B.C.

Meanwhile Hellas was extending abroad. At an early date settlements of Doric, Ionic, and Æolic Greeks had been made on the coast of Asia Minor and the adjacent islands, the first to the south, the second in the centre, and the third to the north. By about 700 B.C. Syracuse, Agrigentum, and other cities in Sicily were founded, and colonies from Tarentum round the coast to Cumæ were laying the basis of a "Great Hellas," in Italy. In the east Byzantium was settled in 657 B.C., and within the next century towns from the Crimea to Spain and the coast of Africa seemed to be claiming a universal empire for the Hellenic name. Each colony went forth from "the mother city" under a leader, who bore with him fire from the public hearth. This filial tie was more than nominal. The appeal of a colony for help met with ready response, and probably nothing but the habit of quarrelling among themselves prevented the Hellenes from occupying much of the sovereignty reserved for the people of Rome. [COLONY.]

The tendency of the earlier Greek societies was to pass through oligarchy into democracy, and much of the internal politics of the various cities was concerned with the struggle for power between "the many" and "the few." The kingship was early abolished except at Sparta, and for a time (about 650-500 B.C.) we find in most cities a series of "tyrants" or citizens who acquired supreme authority, perhaps by means of the unpopular character of the ruling oligarchies. The permanent representative of the oligarchical principle was Sparta, which lay, securely girdled by mountains, a city or rather group of five "unwalled, unadorned, adjoining villages" in the Lacedæmonian plain. Its full citizens lived at a public table under a system of military drill. The constitution was ascribed to Lycurgus, of whom little or nothing is known. The two kings, whose hereditary title was never broken, were, in historical times, simply commanders in war. The real authority was with five ephors, elected yearly. There was a senate, composed of the king and twenty-eight leading men, who must be at least sixty years of age. The proposals of this body were accepted or rejected by an assembly of the people, which had no power of initiative. The absence of free discussion may perhaps have prevented the development of literature and art, in both of which Sparta was deficient. The constitution, however, was the only one in an Hellenic city which had a long endurance.

Athens, the democratic rival of Sparta, at first substituted archons for the king. After a time there were nine of these magistrates, one of whom, "the Archon Eponymus," gave his name to his year of office, which thus served in the calculation of dates. At first the citizens belonged to four tribes, the subdivisions of which were based upon belief in the common divine ancestors of the various families. A good deal of discontent seems to have existed in early times, and in 624 B.C. Draco is said to have been ordered to codify the existing laws. The first legislative changes were made by Solon in 594.

He freed large numbers of debtors, and then reorganised the state as a timocracy, in which citizens were ranked in four classes according to their property. He also is said to have appointed a "probouleutic" or preconsidering senate of 400 members, to prepare measures for discussion in the assembly of the people, and to have enlarged the functions of the ancient senate of the Areopagus by giving it the censorship of morals.

In 560 B.C. Athens fell into the hands of a tyrant, Pisistratus, whose son Hippias succeeded him and was expelled in 510. The constitution, although turned to the advantage of the rulers, had been left unimpaired. It now received a democratic impulse from a noble, Clisthenes, who "took the people into partnership" and extended the franchise to resident aliens. To do this under the old system based upon religious ties was impossible; he, therefore, made ten new tribes, which he divided into demes or districts, arranging, in order to avoid dangers from the local strength of any division, that no two demes of the same tribe should be next to each other. He enlarged the senate, making each tribe contribute 50 to the new total of 500 members. From his time the movement in a democratic direction went steadily on. The lot was introduced into elections, and the citizens in their assembly of the Heliaea acquired judicial power and were divided into juries.

While the Athenian democracy thus began to take shape Hellas was approaching a great struggle with an external foe. The Persians had become masters of all Western Asia, when in 502 B.C. the Athenians and Eretrians went to the help of the Ionic colonists who were in revolt. The allies marched inland and burned Sardis, but the Persians soon reasserted their authority and planned a revenge in which they completely failed. In 490 B.C. 9,000 Athenians and 1,000 Plataeans defeated their host at Marathon. Ten years later Leonidas, with 300 Spartans and 700 Thespians, fell in the pass of Thermopylae, but the Persian fleet was destroyed at Salamis. In the next year, on the same day, their forces were defeated on land at Plataea and at sea at Mycale.

A danger, so narrowly escaped, left a sense of the need for united action, and the Athenians became the head of a league for the defence of the Aegean Sea called "The Confederacy of Delos." Little by little, however, they usurped power. They transferred the treasury from Delos to Athens, which rapidly assumed the position of a capital. At sea they defeated the Persians at the mouth of the Eurymedon in 466, and on land, ten years later, they humbled a league of Boeotian cities at Aenophyta, and spread their supremacy northwards over Boeotia, Phocis, and Locris. Their dream of a land empire was brief. In 447 a defeat at Coronea compelled them to abandon Boeotia, just as they were about to pass, under Pericles, into the period of their greatest glory. This statesman curtailed the old aristocratic senate of the Areopagus, and ensured the better working of the jury system by payments to the jurymen. Not content, however, with completing the democratic movement by legislation, he strove to make the citizens worthy of their

place at the head of the Hellenic States. He spent the money of the allies in the decoration of Athens. He built the Parthenon, the Propylaea, and the Odeon. He gathered Phidias and other great artists round him. He distributed public money, that the poorest might enter the theatre and see the tragedies in which Aeschylus, Sophocles, and other great dramatists taught the legendary care of the gods for the Hellenic world.

The position which Athens thus assumed caused great jealousy to the rival cities, particularly to those to whom the new democracy was, in itself, distasteful. As the result of Athenian interference in a quarrel between Corcyra and Corinth, Sparta, with most of the Peloponnesian States, the Boeotian League, and Phocis and Locris, took the field in 431 B.C. against the Athenians and their subject allies. The course of the Peloponnesian War was marked by a succession of dramatic incidents—the plague at Athens, the destruction of Plataea by the Spartans, the capture from them of Sphacteria, the expedition to Syracuse, where in 413 the Athenian fleet was destroyed. In 405 the Spartan, Lysander, defeated another Athenian fleet at Aegospotami and blockaded the city, which was forced by famine to surrender. He set up Thirty Tyrants to rule in it, who acted with such cruelty that in 403 the democracy was restored, but the day of Athens was past.

Sparta then took the lead, and established oligarchic governments in all the subject cities. Fearful, however, of a new Hellenic power which might endanger their interests, the Persians stirred up strife among the various states, and were soon able to dictate the Peace of Antalcidas (387 B.C.), by which each city was to remain an independent unit. Sparta was thus deprived of the hope of empire, but Thebes soon came to the front under Epaminondas, who, in 371, defeated the Spartans at Leuctra. By arranging a league among the cities of Arcadia and making Messenia independent of Sparta, he altered the balance of power in the Peloponnesus, but his death at the battle of Mantinea in 362 led to the failure of his policy.

Ionian Athens, Doric Sparta, and Aeolic Thebes had now failed to bring the cities of Hellas into lasting union, and lay, with all the other cities, weakened by strife, at the mercy of any powerful state which might attack them. Such a state arose in Macedonia, a country hitherto barely recognised as Hellenic. In a spirit prophetic of coming disaster the Athenian Demosthenes urged his fellow citizens to arm themselves against the king, Philip, who was beginning to interfere in Greece. The battle of Chaeronea (338 B.C.) placed Athens in his power. He then caused himself to be appointed commander of all the forces of Hellas, and organised an expedition against Persia. He was, however, murdered in the midst of his preparations, and left the last act in the two centuries of struggle against the Persians to his son Alexander, who in the battles of Granicus, Issus, and Arbela made himself master of the East as far as India. In Egypt he founded Alexandria, and in many other places settled Hellenic colonists, thus beginning a policy which was extended by the generals among whom, after his death, his dominions were divided. From this time dates the

new Hellenism of Egypt and the East, which produced the Hellenistic Greeks of the New Testament.

In Hellas itself confusion ensued, until, at last, two leagues, the Achæan and Ætolian, for a time maintained freedom, but a quarrel with Sparta and division among themselves, again brought the country under Macedonian influence, which only ceased when, in 146 B.C., it became the Roman province of Achæa.

Under the Romans Greece was at first treated fairly well, and much of the old municipal life was left. Hellenic culture fascinated the conquerors. Greek teachers poured into Rome, and Athens became the university for wealthy Roman youths. Little by little, however, the government became more oppressive. In the Mithradatic War the Greeks rose in a revolt which led to a devastating march of Sulla across the country and to the storming of Athens and the massacre of its inhabitants. Greece was then exposed to the exactions of the Roman officials on the one hand, and to the ravages of pirates on the other. In 267 B.C. the Goths swept across the land, destroyed many towns, and captured Athens, from which they were dislodged by the forces of the historian Dexippus.

In internal affairs the tendency during the following centuries was to more and more centralised rule on the part of the Romans. The Emperor Hadrian attempted to improve the condition of the Greeks by giving them rights equal to those of Roman citizens, by reforming the administration of justice, and by paying attention to roads and buildings. Constantine, the first Christian Emperor, took the important step of changing the capital from Rome to Byzantium, which he solemnly dedicated in 333 A.D. and called, after himself, Constantinople. The Emperor, having been the political head of the pagan religion, naturally assumed the same direction of the Christian faith, and, in the opposition of the orthodox Church to the Arianism, of the first Christian Emperors the people found a vent for the national feeling which chafed against the despotism of an alien court. Theodosius the Great (378-395) first established Christianity as the religion of the state. His sons, Arcadius and Honorius divided the Roman dominions between themselves, and Constantinople became the capital only of the Eastern Empire. At this time a great danger threatened Greece from Alaric and his Goths, but barbarians came and went; the centralisation of power in the hands of the Emperor remained and increased. Administration was portioned out among an army of officials, and "the people," says an historian, "had no position in the state but that of tax-payers."

This system of bureaucracy reached its full development under Justinian (527-565 A.D.), whose reign was also marked by the closing, in 529, of the philosophical schools of Athens. In the following century the empire began to be threatened by the Saracens, who rapidly spread westwards; and, little by little, as its extent was narrowed to Greece and the surrounding districts, it lost its Roman character and became what is known as the "Byzantine Empire." Under the Iconoclast Emperors in the eighth and ninth centuries a fierce struggle raged

in the Church about the worship of images, but petty as were its theological interests, the empire performed an important service in stemming the course of Saracen conquest. Internally the administration was good enough to permit a flourishing commerce. Trade, however, suffered seriously in the eastward rush of the Crusades, and the most important industry, the production, weaving, and dyeing of silk, was ruined in 1146 by the Norman, Roger, who transferred most of the artisans to Palermo. In 1204 the Crusaders and Venetians captured Constantinople, and divided the Empire—an act which has been taken as the end of "the Byzantine phase of the Eastern Empire." Baldwin, Count of Flanders, was elected Emperor of Romania, and reigned at Constantinople. Many new states sprang out of the partition, and new empires were founded at Nicæa, Trebizond, and Thessalonica. The feudal system was established in Greece. Athens became a fief of Romania, governed by dukes; a great part of the Peloponnesus was kept first by Franks and then by Neapolitans, as the Principality of Achæa. The Venetians obtained possession of most of the islands.

Of all the confused and crowded events of these times probably the most important was the capture of Constantinople in 1261 by Michael Palæologus, Emperor of Nicæa, but no attempt to hold Greece could long endure in the face of the Ottoman Turks who soon began to threaten from the East. In 1453 the Sultan Mohammed II. took Constantinople. The one incident in the intermittent struggle which followed with the Venetians is worth mention. When the Turks were besieged in Athens by Morosini in 1687, a bomb fell amongst the powder which they kept stored in the Parthenon, causing an explosion which shattered the temple. The Venetians finally surrendered all claim to most of their Greek possessions by the Treaty of Passarowitz in 1718.

During the rule of the Turks the Greeks endured many hardships, including a curious tribute of children, who were educated by Mohammedans and trained for service in the corps of Janissaries. It was, however, to the interest of the Sultans for the sake of their revenues to encourage Greek commerce, and so there were wealthy classes with culture enough to make a fruitful soil for the teaching of the French Revolution. The spirit thus implanted led to the War of Independence in 1821—memorable for the generous sympathy of Byron, for the long siege of Missolonghi, and for the accident which led to the defeat of the Turkish fleet at Navarino in 1827 by English, French, and Russian vessels. In 1832 Otho of Bavaria was made King of Greece, but his rule was unsuccessful, and he resigned in 1862. The crown was then offered by the Greeks to Prince Alfred of England, who was prevented from taking it by a previous engagement between the great Powers. It was afterwards bestowed on a son of the King of Denmark, who now reigns as George I., King of the Hellenes.

Present Constitution. Legislation is in the hands of the king and of a Parliament of one Chamber

bearing the time-honoured name Boulé. Its members are elected by universal manhood suffrage, are paid during their tenure of office, and sit for four years. To the Boulé the ministers are responsible, and for local government the country is divided into nomarchies, eparchies, and demarchies.

Language. [THRACO-HELLENIC.]

Literature. Each of three divisions of the Hellenic people, Ionic, Doric, and Æolic, had its own dialect, and has left its own literary record, although the masterpieces of the great Athenian authors were written in a fourth kind of Greek, Attic, the final perfection of Ionic. The earliest writings which we possess are the Homeric poems, composed in Asia Minor some time before the first authentic chronology begins. Beyond the facts that their finished execution presupposes a still earlier development of literature, and that they were composed in the Ionic form of speech with a certain admixture of Æolic, we know little of their history. Nothing at all is known of the author; it is even doubtful if the same origin can be assigned to the *Iliad*, which tells the siege of Troy, and to the *Odyssey*, which deals with the adventures of Odysseus on his homeward way. The grammarians of Alexandria were divided in opinion, some holding that one poet composed both poems, others, the "Chorizontes," that the differences between them are so great as to involve two authors. A century ago Wolf turned the controversy in a new direction by attempting to divide the *Iliad* into a number of separate lays, and since his time criticism has been incessant upon the poems. The so-called Homeric *Hymns* are later compositions, which formed the prelude to public recitations from Homer. The poems of the Epic Cycle, now lost, dealt with further legends arising out of the tale of Troy. The epics of Hesiod are of a different class. *The Works and Days* give instruction upon farming, while *The Theogony* treats the legendary history of the gods.

The first variation from epic poetry was the elegy, an expression of the poet's feeling on the current topics of the day. Its earliest composer, Callinus (about 690 B.C.), like many other early poets, was an inhabitant of Asia Minor. He was followed by Tyrtaeus, Solon, Theognis, the poet-philosopher Xenophanes, and Simonides of Ceos. Iambic verse arose in the satire of Archilochus and Simonides of Amorgos. Lyrical poetry had a high development in the Æolic Greek of Alcæus and the poetess Sappho, in the Ionic of Anacreon, and the Doric of Pindar, whose *Epinicia* or *Songs of Victory* we are fortunate enough to possess. They were written to celebrate success in the Olympic and other games, and blend, in sublime strains, the history of the victor with the legendary glories of his family. Doric lyrics took also a form which connected them with the stage. From the dithyramb, or choric dance and song in honour of the god Dionysus, arose in the hands of Alcman, Arion, and Stesichorus a new form of the chorus, to be the basis of the Attic drama of the fifth century before Christ, which, as has been well said, "combined the lyric and choric song with the living action of iambic dialogue, thus constituting the

last ascending movement in the poetic genius of the race."

Athens was the scene of the perfection of the drama, where plays were performed at the festivals of Dionysus. Tragedies, as a rule, were exhibited in sets of three, called "Trilogies," dealing often with the development of a single story, and the performance ended with a "Satyric Drama," in which the chorus was composed of those woodland companions of the wine god Dionysus, the satyrs. Tragedy was more than a mere acting of plays. It had a profound religious meaning. With Æschylus it taught a mythology of awe-inspiring grandeur, through which was wrought out the triumph of righteousness and vengeance upon crime. Sophocles, with much of the same religious spirit, treated the deepest affections of human nature, and showed their basis in the unwritten eternal laws of the universe. Euripides had a less lofty range, and was influenced by philosophical questionings which gave no trouble to the piety of the other two great authors, who with himself became the representatives to future ages of the band of poets who contested with them for the prizes awarded by the state for tragedy, but whose works have perished. The period covered by their lives was that of the glory of Athens. Æschylus fought at Marathon, and Sophocles and Euripides died within the year before the ruin of Athenian supremacy at Ægospotami.

Comedy was also acted at the Dionysiac festivals. The attacks made in it by Cratinus upon living men turned it into a political weapon. Aristophanes (448-380 B.C.) was the greatest master of this satirical comedy, which he directed with unsparing wit against demagogues and philosophers alike. Menander (342-291 B.C.), whose plays have not been preserved, was the great poet of the New Comedy. His plays were much imitated by the Roman dramatists.

Meanwhile a prose literature had developed. Herodotus (born 484 B.C.) wrote a history of the struggle with Persia, full of quaint personal observations made upon his extensive travels, and tracing the ways of divine retribution in a most dramatic manner. Thucydides (born 471), in his account of the Peloponnesian War, founded scientific history. He was followed by Xenophon, who wrote an account of the march of the 10,000 Greeks across Asia, a fanciful life of Cyrus, and a record of the sayings of his master in philosophy, Socrates, whose teaching was given in a finer literary form by Plato (429-387), who made it the vehicle of his own ideal system. Contemporary with him was Aristotle, who founded the school of the Peripatetics, just as Plato founded that of the Academy. Epicureanism, a later school, was founded by Epicurus (342-370), and Stoicism by Zeno (344-260 B.C.).

In both philosophy and history were traces of the direct oral expression which was necessary in communities whose centre was the market-place, and which led in Athens to a magnificent development of oratory. Of the ten Attic orators who were ranked apart, Demosthenes (384-322) was the greatest, whose enmity to the Macedonian rule cost him his life.

With the settlements founded by Alexander and

his successors the literature of research may be said to have begun, particularly at Alexandria, which, with its magnificent libraries, attracted scholars and men of science during many centuries, among them Euclid, who about 300 B.C. produced his immortal propositions. The only original work of this period which deserves notice was the bucolic poetry of Theocritus, Bion, and Moschus, which inspired the *Eclogues* of Vergil, as well as the English pastorals, of which Milton's *Lycidas* and the *Adonais* of Shelley are the best examples.

The same characteristics are found in the Roman period. The wit, satire, and profanity of Lucian in the second century after Christ were almost the only effort of high genius amidst generations of painstaking erudition. Ptolemy, about the same time, taught a system of astronomy which endured until the time of Copernicus. Among historians may be mentioned Polybius, Diodorus Siculus, Josephus, Arrian, Appian, and the ecclesiastical writers, Eusebius, Socrates, and Sozomen. Strabo and Pausanias wrote on geography. Plutarch composed biographies of lasting interest. In philosophy Epictetus, the freed slave, found a recorder of his teaching in Arrian; the Emperor Marcus Aurelius left deeply religious *Meditations*. In the third century a new mystic school arose, with the Neoplatonists, Plotinus, Porphyry, and Iamblichus, and, following the growth of the Canon of the New Testament, came a line of Christian teachers and theologians, among them Justin Martyr, Clement of Alexandria, Origen, Athanasius, Chrysostom, Gregory of Nazianzus, and Gregory of Nyssa.

Under the Byzantine Empire the drama flourished to some extent, and large numbers of histories were produced, of which only those of Procopius (500-565) had much literary merit. In the seventeenth century Vincenzo Cornaro wrote the *Errotocritus*, a love story, which ranks as the epic of modern Greece, and in the eighteenth the scholar Koraës, by his efforts to fix a pure standard, made himself the "legislator of the modern Greek language." The time of revolution had its poet, Rhexas, who was shot in 1798. Later came the great lyrical poet Christopulos (1772-1847), the brothers Panagiotis and Alexander Soutzos, and Rhangabé, both novelist and poet. The language of the modern kingdom, although with certain alterations of inflexion, syntax, and vocabulary, is still derived from the speech of ancient Athens, and, by its present vigour, gives hope of an Hellenic future worthy of the great Hellenic past. [GREEK ARCHITECTURE, and also articles on SCULPTURE, PAINTING.]

Population. The Greeks are the most richly-endowed people of antiquity, forming the southern division of the Thracio-Hellenic branch of the Aryan-speaking populations, who are found from prehistoric times in joint and exclusive possession of the Balkan peninsula from the Danube to the Mediterranean and from the Adriatic to the Ægean Sea. In Greece proper the Thracian element was represented by the Pelasgians, who were the first possessors of the land and who were later absorbed by the Hellenic intruders from the north. The Pelasgians are sharply distinguished by Herodotus from the Greeks of history, whereas the two peoples are

identified by Dionysius, who declares that "the Pelasgian race is Hellenic." But there were clearly differences, which account for the two physical types recognised and perpetuated by Greek art and literature—the heroic, of ideal beauty, symmetrical figure of medium height, fair complexion, oval face, aquiline nose, small mouth and sharply-chiselled features, and the plebeian, of low stature, dark complexion, round face and less regular features. The languages also doubtless presented considerable diversity, to which was probably due the marked variety observable especially in the phonetic systems of the Hellenic dialects. The Greeks, so named by the Romans from an obscure semi-Pelasgian tribe with whom they first came in contact, originally comprised a large number of independent tribes, such as the Achæans, Danai, Argives, Dolopes, Myrmidons, and many others, all of whom gradually accepted the collective name of HELLENES, that is, according to the Hellenic legend, descendants of Deucalion's son Hellen, whose two sons, Æolus and Dorus, and grandson, Ion, were supposed to be the progenitors of the ÆOLIANS, DORIANS, and IONIANS, the three main divisions of the Hellenic race. From the remotest times this race had already spread throughout the whole of Greece proper, all the adjacent islands, the western shores of Asia Minor, Sicily, and a great part of Southern Italy, which thence took the name of *Magna Græcia*. Later numerous colonies were founded round the shores of the Black Sea, in Egypt (Naucratis), in Libya (Cyrenaica), and as far west as Southern Gaul (Massilia), and all these settlements maintained constant relations with the mother country. They formed with it the Greek world of antiquity, which was greatly enlarged and acquired more unity and amplitude by the conquests of Alexander the Great, after which Pergamus, Antioch, and Alexandria became great centres of Hellenic culture on the Asiatic and African continents. The Greeks excelled all peoples ancient and modern in the æsthetic sense, manifested in every branch of art and letters and characterised especially by an exquisite feeling for form combined with a repose and sobriety of treatment contrasting sharply with the exuberance of the "romantic" school. But Greek art had its limitations, as, for instance, in architecture, which never assimilated the arch; and it was, perhaps, somewhat deficient in depth and passion. The Greek character was also certainly deficient in the moral sense. How far the present inhabitants of Greece are the lineal descendants of the Hellenes is a question still much discussed by anthropologists. During the Roman occupation few Italian colonists settled in the country, which was already well peopled by a superior—at all events, a more intelligent and versatile—race. Hence these intruders were speedily Hellenised everywhere in Greece proper, and succeeded in retaining their Latin speech and culture only in the more barbaric northern regions, where they are still represented by the Kutzovlacks of the Pindus uplands and by the Roumanians of Moldavia and Wallachia beyond the confines of the Greek world. But Greece itself was overrun, wasted, and almost

depopulated in the sixth century by fierce Slavonic hordes, who settled in the country and for a time transformed it to a southern extension of the Slav domain. Even after their reduction by the Byzantine emperors (807) the Peloponnesus and adjacent districts were but slowly repopled by immigrants of mixed origin from the Archipelago and Asia Minor, peoples who no longer even called themselves Hellenes, but "Romans," and who no longer spoke the classic language of Hellas, but a degraded "Romaic" dialect. And this neo-Greek or Byzantine mixture, superimposed on a Slav substratum, was in its turn subjected in the tenth and eleventh centuries to Bulgarian and Uze invasions, in the fourteenth to the Frank occupation, then to the more permanent Venetian conquest on the coastlands and in the Ionian Islands, followed by the long struggles of Albanians, Serbs, and Turks for predominance in a ruined Greece, and by the continuous infiltrations from Albania down to the present century. Sixty years ago Attica was little more than an Albanian province and Athens an obscure Albanian village, and the present national costume throughout Greece is distinctly Albanian. Consequently the remarkable revival that has since taken place has largely consisted in a transformation of Albanian and other foreign elements, rather than in a restoration of the old Hellenic stock, which had perished everywhere on the mainland except in a few inaccessible upland districts, particularly in Laconia and the southernmost peninsulas. Nevertheless, these transformed elements, constituting, probably, nine-tenths of the present Greek nationality, are already largely imbued with the old Hellenic spirit, derived, so to say, from the very atmosphere of their hallowed surroundings. They are a brave, enterprising, and highly intelligent people, lovers of letters if not of art, passionately devoted to the education of their children, daring mariners and great traders, but also, like the Hellenes of classic times, somewhat frivolous and untrustworthy. The Greek traders bear an indifferent reputation for honesty throughout the Levant. (J. P. Fallmerayer, *Geschichte der Halbinsel Morea*, etc., Stuttgart, 1830, and numerous other writings dealing specially with Hellenic ethnology; G. Finlay, *Mediæval Greece*; G. Nicolucci, *Sull' Antropologia della Grecia*, Naples, 1868.)

Greek Architecture. The only buildings of the ancient Greeks which are still preserved are their temples, for of their theatres little usually remains except the seats. The form of a Greek temple is usually oblong, but sometimes square. Oblong temples consist of a cell, which is the main part of the building, and a portico at one or both of the ends. They are of several kinds, which differ in the position and arrangement of the external columns. In the temple called *in antis* the front portico is formed by prolonging the side-walls of the cell, which end in *antæ* or pilasters, and between these there are two columns. The *prostylos* temple has four columns in front of the *antæ*, and none between them. In the *amphiprostylos* this arrangement is adopted at both ends. In the

peripteral there are rows of six columns at both ends, connected by a colonnade on either side. The *dipteral* had eight columns at the ends, and a double colonnade at the sides. Temples are also classified as *tetrastyle*, *hexastyle*, *octastyle*, and *decastyle*, according as to whether they have four, six, eight, or ten columns in the porticoes. The triangular face over each portico, caused by the slope of the roof, is called the pediment. It corresponds to the Gothic gable, but has less acute an angle at the apex. The roof rests on a horizontal surface of stone supported by the columns, which is called the entablature, and consists of three parts, the lowest being termed the architrave, the central the frieze, and the moulded and projecting portion immediately below the roof the cornice. All Greek columns have capitals (q.v.) surmounted by an abacus (q.v.), and all excepting the Doric have bases.

Greek architecture passed through three stages, which are distinguished by the different character of the "orders" peculiar to each. An order is defined by taking a single column together with the part of the entablature immediately above it. In consequence of this difference the three varieties are known as the Doric, Ionic, and Corinthian Orders.

The Doric Order. The earliest example of classical Greek architecture, as opposed to Pelasgic (q.v.), is the Doric temple at Corinth, which was probably built about 650 B.C. The resemblance of the column in this order to the pillars found in the rock-hewn tombs of Egypt shows that Doric architecture in its earliest form must have had an Egyptian origin. By the Greeks it was carried to a height of perfection which made it one of the noblest products of human art. Its most characteristic feature is its low and massive columns, from 4 to 6½ diameters in height. They are without bases, and slope inwards from the ground towards the capital, so as to produce an impression of strength and support. Each shaft has 20 flutings, which consist of hollows forming less than a semi-circle, and are divided by a sharp edge. The mouldings (q.v.) of the capital consist of a quirked ovolo immediately below the abacus, which is a plain square, and two or three small flat fillets called annulets separated by channels below the ovolo. There is a deep channel in the shaft of the column a little below its upper extremity, but the flutings are continued upwards as far as the capital. Between the architrave and the frieze there runs a fillet called the *tænia*.

The frieze is adorned with triglyphs, groups of three projecting vertical bands, which are separated by spaces termed metopes. Below each triglyph, underneath the *tænia*, there is a row of small ornaments called *guttæ* ("drops"). The frieze is surmounted by a broad fillet, called the capital of the triglyphs. On the soffit of the cornice, above each metope and triglyph, there are flat blocks called *mutules*, which often have *guttæ* on their under side. The pediments and sometimes the metopes are adorned with sculpture. The most beautiful example of this order is the Parthenon or temple of Athene at Athens (q.v.). Next to it

rank the Theseum at Athens and the temple of Zeus at Olympia. All these buildings belong to the age of Pericles, the most flourishing period of Greek art and literature.

The Ionic Order lacks the massive character of the Doric, but it is lighter and more graceful. Its most striking characteristic is the large spiral on the capital, which is called a volute. This and other features show that it was derived from Assyria. Each capital has four volutes immediately below the abacus, which present a flat surface on the two opposite sides. On the shaft, which is about nine diameters high, there are usually 24 flutings, separated by fillets, but sometimes they are plain. The chief moulding is the echinus (the name given to the ovolo when it is enriched with the "egg-and-anchor" or "egg-and-tooth" ornament), below which there is sometimes a necking with the "honeysuckle" (as in the Erechtheum), or some other pattern between the two annulets. The characteristic base of the order is that known as the "Attic base." The entablature is either plain or ornamented. There is often a row of dentels ("little teeth") on the bed-moulding of the cornice. The finest specimens of the Ionic order are the Erechtheum (built about 420 B.C.) and the temple of Nike Apteros at Athens. One of the porticoes of the former displays a very remarkable feature, "Caryatides" (q.v.) or draped female figures being used in the place of columns. They show the same minute care in the details of their construction which characterises the buildings of the Doric period.

The Corinthian Order. The most ancient example of the Corinthian order—the most ornate of the three orders, in which Greek architecture appears in its decline—is the Choragic monument of Lysicrates at Athens (335 B.C.). The Temple of the Winds at Athens and that of Zeus Olympios at Athens are also examples of this order. The most characteristic feature is again the capital. Its bell-like form may have been adopted from Egypt, but it retains the Asiatic volutes. One of these is placed beneath each of the corners of the abacus, which in this order have a projecting form, owing to the hollowing of the sides. Corinthian capitals, however, exhibit considerable variety in the treatment of detail, and those in the Temple of the Winds differ entirely from any other Greek capitals. Generally smaller volutes are introduced between those at the corners, and these are sometimes made to interleave. Above them, at the inmost point in the recess of the abacus, there is a flower or some other ornament. The lower part of the capital is usually adorned with two rows of leaves, one above the other, the volutes rising out of the upper row. They represent the foliage of various plants, especially that of the acanthus, the imitation of which is one of the chief beauties of this order. The height of the whole column is about ten diameters. The entablature is usually much ornamented, and the architrave is divided into two or three stages. The cornice is enriched with dentels, and beneath its corona there are modillions—projecting brackets corresponding to the earlier mutules.

Greek Church. The separate existence of the Greek or Eastern Church dates from the eleventh century. The disputes which resulted in the division of the ancient Church into two sections arose from two causes: the opposite tendencies of Christianity in the East and in the West, and the aggressive policy of the Roman see. The Greek love of speculation, which prevailed in the eastern churches, led them to attach great importance to minute points of doctrine, whereas the western churches laid stress on the moral or practical side of Christianity and favoured a strict enforcement of clerical discipline. The removal of the seat of empire to Constantinople enabled the Bishops of Rome to arrogate many of the functions of the absent emperors, and, as their civil power increased, they began to claim supreme authority over the whole Church. The Greeks resisted the attempt to enforce clerical celibacy and other disciplinary regulations, but the matter which roused their keenest hostility was the insertion in the Creed of the words *Filioque* ("Who proceedeth from the Father *and the Son*") in support of the doctrine of the twofold procession of the Holy Ghost. The first open rupture occurred in 484, when the Patriarchs of Constantinople and Alexandria were excommunicated by the Pope. The struggle again became acute in the ninth century during the Photian controversy concerning the right of the Patriarchs of Constantinople to the title "œcumenical" which had been conferred on them by the Emperor. The actual separation, however, did not take place till 1054, when the Patriarch Michael Cerularius was excommunicated by Leo IX. Several attempts were afterwards made to effect a reunion, but they all failed owing to the stubborn attitude of Rome on the question of papal supremacy. The last occurred in 1437, when the Emperor John Palæologus, accompanied by the Patriarch, attended the council of Ferrara or Florence in the hope of obtaining assistance against the Turks. Since the fall of Constantinople (1453) no efforts have been made to unite the two Churches.

The doctrines of the Greek Church are based on the early traditions of the Church as well as the Scriptures, and great regard is paid to the teaching of St. John Chrysostom. Only the first seven councils are recognised. The seven sacraments are accepted, but the administration of them differs in many respects from the Roman. Thus infants are confirmed and receive the Communion, which is administered in both kinds, and unction is administered not to the dying alone but to all sick persons. Prayers are offered for the dead, and there is a belief in Purgatory; but the notions regarding it are vaguer than they are in the Roman Church. The Greek Church employs three separate terms to distinguish its attitude of reverence towards both the Virgin and the Saints from actual worship. Churches, as well as houses and streets, are decked with *icons* or pictures of the Virgin and Saints; but, excepting the crucifix, they contain no graven image. The ceremonial is even more sumptuous than that of the Roman Church, but instrumental music is not permitted. The congregation stand during the service with their faces

towards the East, except at Pentecost, when they kneel. The secular clergy are obliged to marry once, but a second marriage is forbidden. The number of monasteries and convents is very large. The chief are those at Mount Sinai, Jerusalem, and Mount Athos, to which all the others are affiliated. The Greek Church does not attempt to gain proselytes, and has never shown any tendency towards persecution. All members of the Church are allowed to read the Bible. Besides the orthodox Greek Church there are several Eastern Churches which owe their existence to early disputes on matters of doctrine. Members of these churches are regarded as sectarians by those belonging to the orthodox Church. [CHALDÆANS, ARMENIANS, MONOPHYSITES.]

After the overthrow of the Eastern Empire the Greek Church became subject to the Turkish sultans. The relations between the Church and the Porte are still determined by an enactment of Mohammed II. prescribing the limits within which the Patriarchs were allowed to exercise ecclesiastical jurisdiction. The four Patriarchs of Constantinople, Antioch, Alexandria, and Jerusalem occupy an independent position within their respective dioceses, but they are all subject to the control of an œcumenical synod. A certain pre-eminence attaches to the Patriarchate of Constantinople on account of its having received the title of "œcumenical." The other Bishops are associated with the Patriarchs in the decision of questions relating to the doctrines and government of the Church. The Patriarchs are elected by the Bishops, but their appointment requires the sanction of the Porte.

The great majority of the orthodox Greeks belong to "national" churches, each of which is under a separate system of church government. The *Church of Russia* dates from the introduction of Christianity into that country in 988. The *Church of Georgia* was founded in the time of Constantine. The *Church of Greece*, the organisation of which is modelled on that of Russia, was established in 1833. The *Church of Servia* regained its early independence in 1830, when it severed its connection with the see of Carlowitz. The *Church of Roumania* separated from the Greek Church in 1861. The Bulgarians have also attempted to set up a national Church, in consequence of which their "exarchate" lies under a sentence of excommunication. The Church of the orthodox or "Byzantine" Greeks in the Austrian Empire is governed by the Archbishops of Carlowitz and Hermannstad, who are subject to the Austrian Government alone. There are eight bishops, six of whom have sees in Hungary and two in Croatia.

Several attempts have been made to establish closer relations between the Greek and the Reformed Churches. During recent years very friendly feelings have existed between the Anglican and Greek Churches, and members of the one often join in the sacraments and services of the other. There has been a Greek Church in England since the time of Charles II.

Outside the Greek Communion are the body of Christians termed "Uniats" or "United Greeks." Ever since the fall of the Eastern Empire the

Church of Rome has made strenuous efforts to win converts amongst members of the Greek Church, and its activity in this direction has increased since the Reformation. The "Unia" is an agreement by which the converts retain a certain amount of their own doctrines and ritual on condition that they acknowledge the supremacy of the Pope. They are most numerous in Southern Italy, Sicily, Austria, and Poland. The amount of liberty conceded to the various groups depends on the degree to which they have been able to maintain their independence in the face of Roman encroachments.

Greek Fire consists of a mixture of various highly inflammable substances, and was much used by the Greeks during the seventh and eighth centuries in warfare--the burning mixture being thrown in bombs at ships or poured from ladles, etc., or projected from long tubes upon the attacking parties. The exact composition is unknown, having been kept a close secret, but it seems to have consisted chiefly of naphtha mixed with sulphur, nitre, and bituminous substances.

Greeley, HORACE (1811-72), American journalist and politician, was the son of a small farmer at Amherst, New Hampshire. At the age of 15 he was apprenticed to a printer at East Poulteney, Vermont. In 1834 he started a literary weekly paper entitled the *New Yorker*, and soon afterwards the *Log Cabin*, which was political. The *New York Tribune*, which he edited until his death, was established in 1841, while the *Log Cabin* and *New Yorker* became merged in the *Weekly Tribune*. The *Tribune* supported a protective tariff, advocated temperance and co-operation, and agitated for the abolition of slavery and capital punishment. In this paper Greeley showed considerable sympathy with the socialistic views of Fourier (q.v.). In 1848 he was elected to Congress. He was one of the earliest members of the Republican party, and was instrumental in securing the election of Lincoln (1860). His efforts to effect a reconciliation between North and South after the surrender of Lee made him very unpopular in the northern states. In 1872 he unsuccessfully opposed Grant for the presidency. He wrote *The American Conflict* (1864), and *Recollections of a Busy Life* (1869).

Greely, ADOLPHUS WASHINGTON (b. 1844), American Arctic explorer, was born at Newburyport in Massachusetts. In 1881 he was appointed head of the American expedition to the north of Smith Sound, undertaken in accordance with the international scheme decided on at Hamburg in 1879. After undergoing terrible privations, the survivors were in 1884 rescued off Cape Sabine by Captain Schley. In 1886 Greely published a narrative of the expedition, entitled *Three Years of Arctic Service*. In 1887 he became chief of the signal service.

Green, JOHN RICHARD (1837-83), historian, was born at Oxford, and received his education at Magdalen College school and Jesus College. After leaving the university he became curate and afterwards vicar of St. Philip's, Stepney. In the midst

of his labours among the East-end poor he found time to contribute historical articles to the *Saturday Review*. In 1868 he was appointed librarian at Lambeth, but an attack of consumption in the following year rendered him incapable of any but literary work. In spite of poverty, illness, and the discouraging advice of his friends, he laboured on at his *Short History of the English People*, which was published in 1874, and immediately established his fame. This work is even more remarkable for its insight into the social life of our forefathers than for its vivid narrative and its grasp of historical principles. *The Making of England* (1882) and the posthumous *Conquest of England* were to have formed part of a continuous history of England up to the Conquest, a project which was cut short by his death.

Green, THOMAS HILL (1836-82), philosopher, was born at the rectory of Birkin in Yorkshire, and educated at Rugby and Balliol College, Oxford, of which he became a fellow in 1860. In 1877 he was appointed Whyte's Professor of Moral Philosophy. Green's influence at Oxford was due as much to his personal character as his philosophic teaching. The latter was based on the philosophy of Hegel, which was moulded by Green into a new and more practical form. He taught that all men should work together in the unity of the Divine Spirit, which realises itself in human action only in so far as each individual feels that his spiritual life is bound up with that of his fellows. Hence Green took a keen interest in popular education and other social questions. He was a prominent member of the Schools Inquiry Commission (1864-66), and bequeathed large sums for university education and higher education in large towns. His works include an introduction to Hume's *Treatise on Human Nature* (1874), two *Lay Sermons* (1878), and the posthumously published *Prolegomena to Ethics* (1883), and his collected essays, published with a memoir, as the *Works of T. H. Green* (1885-88).

Greenbacks, the name given to a class of inconvertible bank notes issued by the United States Government during the Civil War. They received their name from the colour printed on the backs. The term came to be used generally of the paper currency of the United States. Specie payments were resumed in 1879. The "Greenback" or "Independent Party" was formed in 1874 with the object of confining the currency to Greenbacks, for the farmers attributed their prosperity during the war to the frequent issues of these notes. It is now (1893) represented by the "People's Party."

Greenbottle Fly (*Lueilia Cæsar*, Linn.), a common English fly, which lives on hedges, and is remarkable for the brilliancy of its golden green colour.

Greene, NATHANIEL (1742-1786), American general, was born in Rhode Island. He was almost entirely self-educated. Although brought up as a Quaker, he enlisted in 1774, and in 1775 was made commander of the Rhode Island contingent to the revolutionary army. He distinguished himself at the battle of Brandywine, and in 1780 was placed

in command of the army of the south. He was at first unsuccessful in his operations against Cornwallis, who defeated him at Guildford Court House, and forced him to retire into South Carolina. From this base Greene opened up a new attack, reconquered Georgia and the greater part of South Carolina, and by his victory at Eutaw Springs practically decided the contest in the south. He was granted an estate in Georgia, where he died in 1786.

Greene, ROBERT (1560-92), an English dramatist, born at Norwich, was educated at St. John's College, Cambridge. After travelling in Spain and Italy he settled in London as a playwright, and shares with Marlowe the honour of laying the foundations of the English romantic drama. His best play was the comedy of *Friar Bacon and Friar Bungay*, first acted in 1592. His romances—from one of which, *Pandosto* (1588), Shakespeare derived the plot of the *Winter's Tale*—are generally dull and tedious, but they contain many beautiful lyrics. In his *Groat's Worth of Wit bought with a Million of Repentance*, published after his death by Henry Chettle, he attacked Marlowe and Shakespeare. Greene led a dissipated life, and died from the effects of a debauch. After his death appeared *The Repentance of Robert Greene*, in which he laments his own folly and vices.

Greenfinch, GREEN LINNET (*Ligurinus chloris*), a common British finch, distinguished from the true Linnet by its thicker bill. It is a common cage bird, living well in confinement, and readily imitating the notes of other birds. The adult male is about six inches long, with green plumage marked with grey and brown; the female is rather smaller and of duller coloration. They frequent orchards and gardens, feeding on insects, seeds, and fruit, and generally produce two broods in the year.

Greengage, a valued variety of the cultivated plum, introduced from France, where it is known as "la Reine Claude," by Sir Thomas Gage. So established is this race that it will reproduce itself by seed. Land in Kent planted with greengages is said to have yielded £100 an acre in one year.

Greenheart, one of the strongest, heaviest, and most durable of timbers, is the product of *Nectandra Rodiei*, a lauraceous tree, native of British Guiana, which grows to a height of 70 feet. Its grey bark, known as *Bebeeru*, contains the febrifuge alkaloid *bibirine* or *bebeerine*, now known to be identical with *buxine* (C₁₈H₂₁NO₃), the chief ingredient of "Warburg's drops." The greenheart wood is used for keelsons, beams, and blocks in our dockyards, and is classed A 1 at Lloyd's, resisting the white ant and to some extent the ship-worm.

Greenland, an island-continent, most of which is within the Arctic Circle. It is separated from North America by Davis Strait and Baffin Bay. Its nearest point is within ten miles of Grinnel Land. There are more than 3,000 miles of coast, intersected, especially on the west, by fiords like those of Norway, overhung by lofty cliffs. Petermann's

Peak, on the east coast, is 11,000 feet in height, and there are several other considerable elevations. Vast ice-fields stretch across the country, rising, about 30 miles inland towards the east, to a height of 9,000 feet. Though the cold is more extreme in the north, there is less snow than in the south; 68° is the highest recorded temperature, and -66° Fahr. has been experienced. The weather changes very rapidly from brilliant sunlight to thick fog. The chief animals are European, and include the wolf, dog, white and blue fox, white bear, walrus, musk ox, reindeer, Arctic hare, and several species of whales and seals. There are sixty-three kinds of birds, of which all but the raven, ptarmigan, owl, hawk, and some sea-birds are migratory. Eider-ducks are shot in great numbers, and large quantities of their eggs are taken. The inhabitants live largely upon the halibut and other fish; and some 200,000 cod are caught annually on the banks. Only in the south are there any trees. The trade of Greenland, except in the north and north-east, is a Danish monopoly, managed by two inspectors, responsible to the head of a board in Copenhagen. Danish ships arrive and carry away blubber between May and November. In the winter seals are killed. The inspectors are also magistrates, but there is very little crime. They are advised by local councils, but have absolute power.

Greenland was first visited about 986 by Eiríkr the Red, an exile from Iceland, which is only about 100 miles distant. He settled where is now the Eskimo station, Igaliiko. Bjarin, who followed, probably found the coast of America. Christianity was introduced in the 12th century; and in 1261 the Greenlanders swore allegiance to Hakon, King of Norway. From this time they began to be attacked by the Eskimo from the north, and after a time became extinct as a race. When Davis came from England in 1580 he found no inhabitants but the Eskimos. In 1721 Hans Egede, the missionary, came from Denmark, and from that year dates the civilisation of the Eskimos. In 1774 the Danish Government took over the trade, which was being abandoned. The country has been explored in recent times by Inglefield, Kane, Hayes, Hall, Nares (1875-6), and Nansen; in 1869-70 a German expedition visited the east coast, and Mourier led a party there in 1879. Lieut. Peary, of the U.S. navy, in 1891-92 explored to the northernmost point. The aborigines of Greenland, are a branch of the Eskimo race, who call themselves *Kalalit*, "men." [ESKIMO.] They are the *Skrælingar* ("dwarfs") of the early Norse settlers, and this term is even still occasionally applied to them, though it has lost its original sinister meaning. The Kalalits are scattered in small groups along the west coast, far beyond the Danish colonies, traces of their camping grounds having been met by Captain Nares' expedition (1875-76) as far north as 82° N. lat. Even on the much colder east side they range up to 75° N.; but here they are far less numerous; and all the full blood and half-caste Eskimo of Greenland scarcely exceed 12,000 souls altogether. The nomad groups are still pagans, but those settled about the Danish

stations have been evangelised by Danish and Moravian missionaries since the eighteenth century. They are a gentle, peaceful race, but improvident, and of incurably filthy habits, though the offensive odour observed by all travellers is mainly due to their whale, seal and train-oil diet. Physically they differ from the western Eskimo, specially in the shape of the skull, which is highly dolichocephalic, more so than that of any other race except the Melanesians of Fiji and the New Hebrides. Their Eskimo dialect, which possesses translations of the Bible and other religious books, beside some national legends and folk-lore, is still universally spoken, though many understand Danish. (Nansen, Rink, *Le Grænland*, Copenhagen, 1852-57, and numerous other writings.)

Greenlaw's Process, a photographic process for obtaining a "positive" print upon paper, or it may be used for the production of negatives by waxing the paper after printing. The process is carried out in the following manner:—The paper is coated with a solution in water of potassium bromide and iodide, with some free iodine, and is then allowed to dry. It is next immersed in a solution of silver nitrate and acetic acid, being afterwards washed and dried. This is then placed in the camera or in the printing frame and exposed. After exposure it is developed by a strong solution of gallic acid with a little silver nitrate. It is next well washed and fixed by sodium hyposulphite. The process is more suitable for negatives than for positives, but is not of frequent usage among photographers at the present time.

Greenock, a town in Renfrewshire, Scotland, 22 miles west of Glasgow, is situated on the south bank of the Firth of Clyde. Behind the town is a ridge of hills 800 feet in height, from which there is a fine view. Two centuries ago Greenock was a fishing village, but since the middle of the 18th century it has steadily grown. Under charters granted at this time it had the most liberal municipal constitution of all Scottish burghs. At the Reform Bill it became a parliamentary borough, and continues to return one member. The harbour was constructed in 1710, and has since been greatly improved. The James Watt dock was finished in 1886. The commercial importance of Greenock dates from the Act of Union. Its trade was temporarily interrupted by the American War, but soon after the peace it gained great importance as a seat of the shipping trade. The chief of its other industries is sugar-refining. Greenock is connected with Glasgow by two lines of railway. Many passengers prefer to sail from it rather than from the larger port higher up the Clyde. It has a frequent service of steamers to Belfast, Dublin, and Liverpool. The water-supply of the town is derived from Loch Thern and Loch Gryfe, two large reservoirs behind the town, which also afford water-power to the mills. The chief institutions of Greenock are the Wood Mariners' Asylum for decayed seamen, and the public hospital and infirmary. There are two public parks, and a fine esplanade more than a mile in length. The Watt monument contains a statue of James Watt by Chantrey, and a public library.

Green Pigments, etc. [PIGMENTS.]

Green Salt, the first of a large number of ammoniacal platinum compounds, was obtained in 1828, and known as *Magnus Green Salt*. It is formed as a green insoluble powder by the action of platinous chloride, PtCl_2 , upon ammonia, and has the composition $\text{PtCl}_2(\text{NH}_3)_2$. From it a large number of other platin-ammonia compounds were afterwards prepared by the action of various acids and salts.

Greensand, a name applied to certain sandy beds belonging to the Cretaceous system (q.v.), as developed in the British Isles from the presence in them of grains of glauconite (q.v.), though the beds are often clays or limestones, and even more often not noticeably green. The marine beds that immediately overlie the Weald Clay, and are equivalent to the Upper Neocomian of the Continent, are known as the "Lower Greensand." Among their most characteristic fossils are *Perna Mulletii* and *Exogyra sinuata*. They have been subdivided in the south-eastern counties into four series or phases:—

Folkestone beds, silver and iron-shot, sharp, current-bedded sands, 70 to 100 feet thick.

Sandgate beds, less pure sands, with fuller's-earth and chert bands 75 to 100 feet.

Hythe beds, dull and earthy buff and yellow sands with layers of sandstone in Surrey, passing into the Kentish Rag limestone and "hassock" or earthy sandstone in Kent, 80 to 300 feet.

Atherfield Clay, 20 to 60 feet thick. The Folkestone beds are overlaid by the Gault with some apparent unconformability, and only about 20 per cent. of the Lower Greensand fossils pass upward into the Upper Cretaceous.

The Lower Greensand has its most conspicuous development in a range of hills running through Kent and Surrey, S. of and parallel to the North Downs, and reaching in Leith Hill a height of nearly 1,000 feet.

The name "Upper Greensand" is applied to the often compact sandstone above the Gault, the base of the Cenomanian of the Continent. In Surrey it forms a narrow band, usually of a marly character, but occasionally a deep orange sand. It is well developed in East Devon, Somerset, Wilts, and N. Berks, forming two zones: the lower, or *Black-down beds*, the zone of *Ammonites inflatus*; and the upper, or *Warminster beds*, that of *Peeten asper*, *Holaster nodulosus*, etc. To the latter belongs the Firestone of Merstham and Godstone, Surrey.

To a still higher level belongs the so-called "Cambridge Greensand," a layer of glauconitic marl containing erratics and phosphatic fossils derived from the Gault. It is probably on the same horizon as the "Chloritic Marl" and the Red Chalk of Hunstanton.

Greenshank (*Totamis glottis*), a common European sandpiper (q.v.), visiting Britain in spring and autumn, and occasionally breeding in the northern parts. The length is about 14 inches; the plumage shades of brown and grey, darker in the summer than in the winter, when the under surface

becomes quite white. These birds feed on insects, worms, and small molluscs. The popular name refers to the colour of the long legs.

Green Sickness. [CHLOROSIS.]

Greenstone, an obsolescent name, formerly applied to many diabases, diorites, dolerites, and probably other compact crystalline rocks, which, from the presence of hornblende, augite, or viridite resulting from the alteration of such magnesium silicates, have a greenish colour. It is a convenient term in field geology, pending further information.

Green Vitriol. [COPPERAS.]

Greenwich, a town in Kent, six miles S.E. of London by river, on the right bank of the Thames. In the reign of Æthelred II. the Danish fleet moored here. It had a royal residence, called Greenwich House, so early as the 13th century, which, after being granted to two great nobles, reverted to the crown on the death of the "good" Duke Humphrey of Gloucester in 1433. In this palace were born Henry VIII. and his two daughters. It was also much used as a residence by the earlier Stuarts, but was pulled down by Charles II., who began Greenwich Hospital, which was added to in the reigns of William III. and Anne by Inigo Jones and Wren. It was rebuilt in 1811, when a chapel was also erected. It was liberally endowed, and at one time accommodated 3,000 seamen, as well as giving out-door relief to some 5,000 more. In 1869, however, a system of pensions was substituted for the board and lodging; and since 1873 the buildings have been used as a Royal Naval College. There are numerous charitable institutions in Greenwich, among which may be mentioned Trinity Hospital, founded in 1613; Queen Elizabeth's College; the Jubilee Almshouse, founded in 1809 by the natives of the town; and the schools called the 'Orphan Girls', the Green Coat, and the Grey Coat. Greenwich Park, the area of which is nearly 200 acres, was laid out by Charles II., but was enclosed much earlier. From a hill towards the south a fine view of London may be obtained. The Royal Observatory, from the meridian of which longitude is reckoned, was built in 1675. The borough of Greenwich returned two burgesses in the reign of Elizabeth, but was unrepresented from 1577 till 1832. By the Reform Bill it was divided into three single-member districts.

Greenwich Hospital. The Royal Hospital at Greenwich, built on the site of a royal palace, was founded by William and Mary in 1691 as a home for superannuated seamen and marines. These were formerly chosen by the Admiralty, and were lodged, victualled, and clothed by the Hospital, within or without its walls, as well as supplied with pocket-money; but since 1871 the pensioners have wholly ceased to reside on the spot, and the building has been devoted to the purposes of the Royal Naval College (for the technical instruction of officers) and of a naval museum and picture gallery. The pensioners numbered in 1708, 300; in 1728, 450; in 1738, 1,000; in 1751, 1,300; in 1782, 2,300; and in 1805, 2,410 in, and 3,234 out.

Greg, WILLIAM RATHBONE (1809–81), an able essayist, was born at Manchester. He gave up the business of a mill-owner in 1850, and next year published his *Creed of Christendom*. He subsequently contributed to the reviews, and published several other essays, which were collected in *Essays on Political and Social Science, Literary and Social Judgments* (4th edition, 1877), and *Miscellaneous Essays*. He was Comptroller of the Stationery Office from 1864 to 1877, and had previously held a commissionership of Customs. His son, PERCY (1836–1889), wrote novels (*Across the Zodiac*, etc.) and a strongly partisan *History of the United States to 1887*.

Gregarines, a sub-class of the Sporozoa (q.v.) containing a series of parasites. The body is rather complex for the Protozoa, it being divided into three segments, an epimerite, a protomerite, and a deutomerite; the last is the largest and most important, as it contains the nucleus (q.v.). All three segments are not always present; when they are the animal is said to be "Cephalont," but when the first is lost it is "Sporont." The body is composed of three layers, an external or "sarcocyte," an internal or "entocyte," and an intermediate fibrillar once known as the "myocyte." There is usually also a cuticle formed from the outermost layer of the sarcocyte. There are two main groups, the Monocystidea and the Polycystidea; the former live in ascidians, worms, etc., while the latter usually infest insects.

Grégoire, HENRI (1750–1831), a French priest who played a prominent and not dishonourable part in the Revolution, was born near Lunéville. Before the Revolution he had published several works, and was sent by the clergy of Nancy in 1789 to represent them in the States-General. He was one of the first four of his order who joined the Third Estate, and took an active part in the proceedings of the Constituent Assembly. He accepted the position of Bishop of Blois under the new Civil Constitution of the Church, but continued to sit in the Assembly. In the Convention he proposed the motion for the abolition of the monarchy, but opposed the execution of the king and the state renunciation of Christianity. It was on his motion also that the negroes in the West Indies were enfranchised. He showed himself superior to most of the leading revolutionists by doing all he could to restrain vandalism and to protect men of letters. He was a member of the Council of Five Hundred, and also of the Legislative Assembly constituted after the 18th Brumaire; and, although he voted against the Empire and the divorce of Josephine, he was created a Count and an officer of the Legion of Honour. In 1819 he made an attempt to re-enter political life, but his election was annulled. When he died the Church refused him her rites.

Gregorian Calendar. [CALENDAR.]

Gregorian Telescope is one type of reflecting instrument, the others being due to Newton, Cassegrain, and Herschel. In the Gregorian instrument rays of light are reflected back from the large

concave mirror, and after passing through the focus are again reversed in direction by a small concave mirror that brings them to a focus a short distance behind the great mirror, in the centre of which a small hole is cut to let them pass. An eye-piece is adjusted to receive them from this second focus and transmit them to the eye of the observer. The general disadvantages of this type of instrument are referred to in the article on telescopes.

Gregory I., called "the Great," Pope of Rome, was born towards the middle of the sixth century. Previous to the death of his father he took an active part in civil affairs, but at that period he gave up his property to pious uses, embraced the Benedictine rule, and passed his life in prayer and charitable works. He represented the Papacy at Constantinople for more than three years, and in 590, soon after his return, was chosen Pope, but did his utmost to avoid taking the office. His pontificate lasted fourteen years, during which order was restored in Rome, ecclesiastical discipline was strengthened in France and Italy, heresy was vigorously combated in Spain and Africa, and England was evangelised. Gregory died at Rome in 604. Numerous works are attributed to this Pope, who had a great dislike of all secular learning. The *Moralia*, an exposition of the Book of Job, and Homilies on the Gospels and Ezekiel are undoubted, but the work on the seven Penitential Psalms is almost certainly spurious.

Gregory VII., better known as HILDEBRAND, was born about 1015 at Saona in Tuscany, where his father is supposed to have been a carpenter. He passed his early years in a monastic house at Rome, and in 1046 became one of the chaplains to Gregory VI., whom he accompanied into exile in Germany. He next passed some time as a monk at Clugny. He persuaded Bruno, when elected Pope as Leo IX., to refrain from exercising his authority until he had not only received nomination from the Emperor but had also been elected and consecrated at Rome, and over his successors, Victor II., Stephen IX., Nicholas II., and Alexander II., his influence was unbounded, and he was himself Pope in all but name. At length in 1073, on the death of the last-named, he was persuaded to accept the tiara for himself, when he took the title of Gregory VII. in memory of his earliest friend. He immediately set himself to reform the Church from within and to protect it from without. Celibacy was restored and simony repressed, and in 1075 the Investiture struggle was initiated by a decree declaring any clerk who should receive office from lay hands liable to deposition and any layman who should presume to confer it subject to excommunication.

In 1076 the Emperor Henry IV. was cited to appear at Rome to answer charges of simony, sacrilege, and oppression; and when he replied by declaring Hildebrand deposed at the Diet of Worms the Pope rejoined by excommunicating him and the bishops who had attended. The German clergy now yielded, and Henry came and did penance at Canossa. Soon after this, however, he again defied Hildebrand, and, invading Italy in

1080, took Rome after a siege of more than three years, and set up Guibert as Pope Clement III. Hildebrand at first shut himself up in the Castle of St. Angelo, and even when Henry had to return to Germany dared not remain in Rome, where his strict rule had made many malcontents. He therefore fled to the protection of Robert Guiscard the Norman at Salerno, where he died a year later on May 25, 1085. Hildebrand was one of the greatest men of the Middle Ages. He not only laid the foundations of the temporal power of the Popes, but also rescued the Church from the stagnation into which it had fallen. Had he not made so firm a stand as he did for the rights of the spiritual power, it seems doubtful whether there would have been any refuge in the Dark Ages from the tyranny of arbitrary kings and feudal despots. Gregory VII. has had many biographers, Italian, French, and German. Villemain's *Histoire de Grégoire VII.* was translated in 1874.

Gregory IX., nephew of Innocent III., was elected Pope in 1227, and carried on a struggle with the Emperor Frederick II. as Gregory VII. had done with Henry IV. Frederick was first excommunicated for not going on crusade, and, having failed in his invasion of the Papal territories, was fain to ask absolution in 1230. Two years later the Pope was driven from Rome, and had to appeal to the Emperor for help. In 1239, however, their relations again became hostile, and a second sentence of excommunication was launched. War was still proceeding when Gregory died in 1239. This Pope was a personal friend of Francis of Assisi, whom he canonised together with Saint Elizabeth and Dominic. He was a learned lawyer, and caused the compilation of the Decretals in 1234. His attempts on the liberties of the English Church were more successful than his attacks on those of the French.

Gregory XIII. [CALENDAR.]

Gregory XVI. (CAPPELLARI), was born at Belluno in 1765. His name first became known in 1799, when he published his *Trionfo della Santa Sede* against the Italian Jansenists. After the return of Pius VII. to Rome he was made councillor of the Inquisition and Prefect of the Propaganda, and in 1825 was created Cardinal. In 1831 he succeeded Pius VIII. as Pope. In the course of a fifteen years' pontificate he opposed the spread of revolutionary ideas with much vigour, and was also charged with many acts of cruelty. He also began to develop Ultramontanism, which reached its high tide under his successor Pius IX., who was elected Pope on his death in 1846.

Gregory of Nazianzus, ST., a father of the Eastern Church, was born in Cappadocia about 330. While studying at Athens he became acquainted with Basil. After acting for some years as assistant to his father, who was Bishop of Nazianzus, he on his death in 374 retired to Seleucia. About 379, however, he was summoned to Constantinople to head the orthodox party there, and, having been a successful champion, was made

bishop with the sanction of Theodosius. His promotion, however, seems to have caused some jealousy, and he soon resigned and retired to Nazianzus, where he died about 390. He gained the surname of "Theologus" for his defence of the doctrine of the Trinity; and his invectives against Julian are well known. He was also an able letter-writer and a powerful orator.

Gregory of Nyssa, ST., a younger brother of St. Basil, was born about 330, and was ordained Bishop of Nyssa in Cappadocia about 372. He was deposed by Arian influence for three years, but returned in 378. In 381 at the Council of Constantinople he was an eloquent champion of orthodoxy, and the additions then made to the Nicene Creed are thought to have been due to him. Next year he visited Jerusalem, and in his letter *De Euntibus Hierosolyma* condemned the practice of pilgrimage. In 385 he delivered the funeral orations of Pulcheria and the Empress Placilla. He died between 395 and 400. He was the author of numerous works, of which the chief were the *Treatise against Eunomius*, controversial works against the Arians, Manichæans, and other heretics, and several expository and homiletical works.

Gregory of Tours, ST., author of a *History of the Franks*, was born at Clermont about 540. In 573 his own reputation as well as the position held by his family procured his election to the bishopric of Tours. The protection which he accorded to the victims of tyranny brought upon him the wrath of Fredegonde, but when charged by her with treason he was acquitted. In 581 he acted as mediator between Chilperic and Childebert, and as he grew older his political influence continued to increase. He died at Tours in 594. The *Historia Francorum*, of which there are ten books, is the earliest of French chronicles. It is utterly uncritical, but is valuable none the less as an honest record. Gregory also wrote a treatise, *De Miraculis*.

Gregory, the name of a Scotch family, the following members of which were eminent:—

1. JAMES (1638–1675), a mathematician, invented the reflecting telescope in 1661, which was in use for more than a century. He was a fellow of the Royal Society, and had much correspondence with Newton and Huygens, the latter of a hostile character. He also published several mathematical works, and was the first professor of the subject at Edinburgh University. He was struck blind by *amaurosis* while lecturing, and died of apoplexy three days later.

2. JOHN (1724–1773), his grandson, was son of James Gregory, professor of medicine at Aberdeen. He studied at Edinburgh and Leyden, and was for three years professor of philosophy at Aberdeen. In 1754 he became a fellow of the Royal Society, and, on the death of his elder brother James, succeeded him as professor of medicine at Aberdeen. He afterwards removed to Edinburgh, where in 1766 he was elected to the chair of practical physic. He was the author of *Elements of the Practice of Physic* (1772) and other works. John

Gregory was intimate with Akenside, Hume, Lord Kames, and James Beattie.

3. JAMES (1753-1821), the eldest son of John, was born at Aberdeen, and went with his father to Edinburgh in 1764. He studied medicine there and on the Continent, and in 1776 succeeded to his father's chair at Edinburgh. He was eminent alike as a professor and a practitioner, and his lectures on clinical medicine at the Royal Infirmary were always crowded.

4. WILLIAM (1803-1858), son of the last-named, a distinguished chemist, held professorships at Glasgow, Aberdeen, and Edinburgh successively. He translated several of Liebig's works, and was one of the first to propound his theories in England.

5. DUNCAN FARQUHARSON (1813-1844), another son of Dr. James, was one of the founders of the Chemical Society, and first editor of the *Cambridge Mathematical Journal*. His important mathematical writings were edited by W. Walton in 1865.

Gregory, OLINTHUS (1774-1841), was born at Yaxley, Hunts. At the age of nineteen he published *Lessons Astronomical and Philosophical*, and in 1802 a treatise on astronomy which made his name known. He had early made the acquaintance of Charles Hutton, whom in 1807 he succeeded in the mathematical chair at Woolwich. He is quite as well known by his biographies of Robert Hall and J. M. Good and his popular work on Christian evidences as by his scientific writings.

Greifswald, a town in the province of Pomerania, Prussia, 20 miles S.S.E. of Stralsund. It was founded in the 13th century by Dutch merchants, and in 1250 received a constitution from Duke Wratislaus. Soon after it formed a league with the Hanse Towns against Denmark and Norway. From 1631 till the Peace of Westphalia it was held by the Swedes, into whose possession it again twice fell, but in 1815 was finally ceded to Prussia. It has a university, founded in 1456. The church of St. Nicholas has a valuable library and a tower 330 feet high. Greifswald has a large corn trade with England, France, and the Mediterranean.

Greiz, a German town, capital of the small principality of Reuss Greiz, is on the right bank of the White Elster, 14 miles S.W. of Zwickau. Its history goes back to the 12th century. In 1550 it came into the possession of the house of Planen. It has been twice destroyed by fire, in 1494 and 1802. The old town church (13th century), the old "Residenz," and a summer palace are the chief buildings. Dyeing and tanning and the manufacture of different kinds of cloth and paper are carried on.

Grenada, one of the British West Indian islands, belongs to the Windward Isles, and is 60 miles from the South American coast, and about the same distance to the north of Trinidad. It is 24 miles long and 12 miles broad. It was discovered by Columbus in 1498, but not settled till the French came to it from Martinique in the middle of the 17th century. It was taken by the British in 1762, but did not finally come into their hands till the peace at the close of the American War (1783). The

soil of the island is very fertile; fruits, nutmegs, and cocoa are the chief productions, and turtles abound on the coast. Ranges of mountains run across, and there are two inland lakes. Grenada is a Crown colony, and has a lieutenant-governor and a council nominated by the Crown. The capital is Georgetown on the south-western coast.

Grenade, a small explosive missile, usually thrown by hand; they were formerly much more used than they are now.

Grenadiers, originally soldiers who threw hand-grenades. The name was afterwards given to the men belonging to the first company of each battalion of infantry, who were distinguished by their height and fine physique, as well as their tall bearskin caps. The Grenadiers now form the first three battalions of the foot-guards.

Grenoble, a town in the south-west of France, formerly capital of the province of Dauphiné, and now of the department of the Isère, on the left bank of which it stands, being 58 miles east of Lyons. It has a very fine situation, looking to the east towards the Alps, and encompassed by hills to the north and west also, though having the rivers Isère and Drac between. The city passed from the Burgundians to the Franks, and again was included in a Burgundian kingdom. In the 13th century it came under the power of the Counts of Albon, afterwards called Dauphins, and in 1349 was ceded to France. Under the governorship of Lesdiguières ("Le roi des Montagnes"), after the accession of Henri IV., it acquired great importance, and in 1788 it vigorously defended its privileges against the central government. It received Napoleon on his return from Elba, but was speedily retaken. Its situation between two rivers has made it liable to floods, the worst of which have been in 1219, 1778, and 1859. Its chief buildings are the cathedral of Nôtre Dame, of which Charlemagne is the traditional founder; the church of St. André (13th century), to which the tomb of Bayard was removed in 1822; the church of St. Laurence, with an 11th-century crypt; and the Palais de Justice (15th and 16th century). There is a university and a valuable library, and among the many institutions are the Académie Delphinale, a large hospital, and a benefit society, which was one of the earliest of its kind. Grenoble is protected by the Bastille standing on the hills towards the north, and has an important school of artillery. It has an extensive glove trade, and liqueurs, straw-hats, and leather are also made.

Grenville, GEORGE (1712-1770), an English statesman, was the second son of Richard Grenville, of Wotton, Bucks. He was educated at Oxford, and was called to the Bar in 1735. Six years later he was elected member for Buckingham, which he represented till his death. He joined the party called the "Boy Patriots," and acted with the Opposition even after his appointment in 1744 as a Lord of the Admiralty. Three years later he went to the Treasury as Junior Lord, and in 1754 became a Privy Councillor after accepting office under Newcastle. He still, however, acted with

Pitt and his brother Lord Temple, and resigned the post of Treasurer of the Navy soon after his appointment both in this and the Devonshire Administration. Having accepted it a third time in 1757, he succeeded in carrying a useful measure providing for the payment of seamen's wages. In 1761 Grenville became a Cabinet Minister, and next year was named one of the Secretaries of State under Bute, but soon exchanged this office and the leadership in the Commons for that of First Lord of the Admiralty. He had now for some time broken with Pitt, and in a debate in March, 1763, in which Grenville defended the proposed cider duty by repeatedly asking to be told *where* new taxes might be laid, that statesman covered him with ridicule by quoting a popular song, "Gentle shepherd, tell me where." The name of the "Gentle Shepherd" stuck to the unfortunate Grenville for years afterwards.

Nevertheless, on the resignation of Bute a month later, Grenville became Prime Minister and Chancellor of the Exchequer, but was very soon obliged to insist on the cessation of the secret influence of the king's favourite. On April 30 Wilkes was arrested under a general warrant for his attack on the King's Speech in the *North Briton*. The king made two attempts to get rid of his Minister in the summer, but failed, and in September the Duke of Bedford and his friends joined the Ministry. In March of the following year a resolution declaring the possible desirability of imposing stamp duties on the colonies passed quietly through the House, and on February 7, 1765, the resolutions definitely imposing them met with as little opposition. After the exclusion of the Princess Dowager's name from the Regency Bill, George III. made another attempt to oust Grenville, and again failed, but soon after induced Rockingham to form a government. Grenville was dismissed in July, 1765. Next year he ably defended the Stamp Act, and in 1767 succeeded in defeating the Ministry on the budget. In the following year he "inspired" a pamphlet which drew a reply from Burke.

In February, 1769, Grenville in an able speech opposed the expulsion of Wilkes from the House; and before his death in 1770 succeeded in carrying an important measure by which the trial of election petitions was transferred from the House of Commons to a Select Committee. George Grenville was an able financier, and possessed such a good knowledge of the business of the House that he was at one time destined for the Speakership. He had a strong sense of duty, great industry, and absolute integrity; but these good qualities were balanced by a lawyer-like narrowness of view, a tendency to verbosity, and a dictatorial manner which offended the king and many of his own colleagues. Burke, in one of his speeches, paid a noble tribute to his character.

Grenville, SIR RICHARD, English seaman, was born in 1540. In 1585 he led a successful expedition against Spanish commerce in the West Indies. In 1587-88 he belonged to the Council which was appointed to take measures against the threatened invasion by Spain, and in 1591 in the *Revenge* he

took part in Lord Thomas Howard's expedition to the Azores. In the course of this a strong Spanish fleet was fallen in with, and Lord Thomas ordered his force to withdraw. The order was, however, disobeyed by Grenville, who threw himself into the midst of the enemy, and, after performing prodigies of valour, was obliged to strike. He died two days later on board the Spanish flagship from the effects of his numerous wounds.

Grenville, WILLIAM, LORD (1759-1834), youngest son of George Grenville, entered Parliament in 1782, and was the same year appointed Chief Secretary under his brother, Earl Temple, who was Lord-Lieutenant of Ireland.

In 1783 he became Paymaster-General under his cousin William Pitt, and also a Privy Councillor. He afterwards held a commissionership on the Board of Control (India), and the vice-presidency of the Board of Trade, and in 1789 was elected Speaker, but resigned a few months later on accepting the office of Secretary of State. In 1790 he also became President of the Board of Control, and in the same year was created a peer, and took the leadership of the Government in the Upper House. In 1791 he became Foreign Secretary. As such he in the following year introduced the Alien Bill, and in 1793 the Habeas Corpus Suspension Bill. In 1795 he passed through the Treasonable Practices Bill and the Seditious Meetings Bill, and in 1799 moved the resolutions for the Irish Union in a four hours' speech. As the measure prepared by himself and Pitt for the emancipation of the Irish Catholics was rejected by the king, they both resigned early in 1801. In his opposition to Addington, Grenville was associated with Fox, and he refused to join Pitt in 1804 because the king would not agree to the inclusion of that statesman in the Cabinet. The cousins had long had divergencies of views on some political questions, and they never afterwards acted together. In 1806 Grenville became head of the Ministry of All the Talents, with Fox as Foreign Secretary. Though the Administration was not as a whole successful, it passed the Bill to abolish the slave trade early in 1807. It did not long survive, as the king not only refused to assent to a Bill for enabling Catholics to hold commissions in the army and navy, but even tried to extort from his ministers a promise that they would never again offer him advice upon the Catholic question.

Overtures to Grenville and his friends to join the Tory Ministry were several times made by the Regent, but their views on Emancipation and other questions prevented the favourable reception of them. Lord Grenville during the next few years continued to lead a section of the Opposition which, while opposing the home and financial policy of the Government, gave their foreign policy a general support. After 1823 he retired altogether from public life. Lord Grenville had all the good qualities of his father, and also his defects of manner, but was, perhaps, a better speaker. He was one of the statesmen who earliest adopted the principles of Adam Smith, and was an able advocate of many social reforms. In foreign affairs he was

in favour of a policy more warlike than that of which the majority of the Whigs approved.

Gresham, SIR THOMAS (d. 1579), founder of the Royal Exchange, was the second son of Sir Richard Gresham, Lord Mayor of London, and was born about 1520. After leaving Cambridge, he was apprenticed to his uncle Sir John Gresham, and also assisted his father. In 1551 he became "king's merchant," or royal agent abroad, and went to live at Antwerp, where he negotiated loans and contracted for the supply of military stores. He was also occasionally employed in diplomatic affairs. In 1565 he offered to build an Exchange at his own cost if the City would provide a site, and the foundation-stone was laid on June 7, 1566. Two years later it was ready for use, and in 1570 was visited by Queen Elizabeth. From the large fortune he had amassed the Gresham Lectures were also endowed, and also eight almshouses. At his house in Bishopsgate Street he gave splendid entertainments, the Queen, Lord Burghley, and Leicester being among his guests. *The Life and Times of Sir Thomas Gresham*, by the Rev. J. W. (Dean) Burgon, appeared in 1889.

Gretna Green, a small hamlet in Dumfriesshire on the English border, 9 miles N.N.W. of Carlisle, was for long a retreat of smugglers, and was also the place where runaway matches from England, called, from its position, "Border" or "Gretna Green" marriages, took place. In 1856 these marriages were made invalid, unless one of the contracting parties had resided in Scotland for three weeks before the ceremony.

Grétry, ANDRÉ ERNEST (1741-1813), a French operatic composer, was a native of Liège. He spent five years at the Liège College at Rome, where he first won success with an Italian *intermezzo*. After leaving Rome he went for a time to Geneva, where he met Voltaire, but ultimately decided to live in France. Here he wrote the music for Marmontel's *Le Huron*, produced in 1768. He afterwards composed some fifty operas, the best of which were *Zémire et Azor*, and *Richard Cœur de Lion*, the latter containing the air, *O Richard, O mon Roi, l'univers t'abandonne*, so famous in the history of the Revolution. He received honours from each of the successive governments which followed, and died at the Hermitage, Montmorency, where Rousseau had once lived. Grétry was deficient in knowledge of harmony and instrumentation, but his music abounds in the peculiarly French grace of expression.

Greuze, JEAN BAPTISTE (1725-1805), a great French *genre*-painter, was born at Tournus. He was taken up by a portrait-painter named Grandon, whom he accompanied to Paris, where he worked at the Académie schools. He was patronised by De Jully, and after many previous successes, exhibited in 1755 his *Areugle Trompé*. In 1761 *L'Accordée de Village*, now in the Louvre, was exhibited, and the year 1765 saw the production of *La Bonne Mère*, *Le Mauvais Fils Puni*, and *La Malédiction Paternelle*, the last two of which are in the Louvre. In 1769 he was received by the

Académie, but it was intimated at the same time that it was on the ground of his *genre* pictures only. The result was that Greuze ceased to exhibit. He died in great poverty, caused mainly by his own extravagance. He became acquainted with Diderot through his marriage to the daughter of a bookseller whose shop the philosopher frequented. Greuze owed much to his choice of subjects and to his engravers, notably Massard, for his treatment was generally in a high degree artificial.

Greville, CHARLES CAVENDISH FULKE (1794-1865), author of the well-known memoirs, was the son of Charles and Lady Charlotte Greville. Having been educated at Eton and Christ Church, he was appointed private secretary to Earl Bathurst at the age of twenty. In 1821 he became Clerk of the Council in Ordinary, an office which he held till 1860. In the discharge of his duties he not only saw much of Court life, but was brought into contact with the leading statesmen of both parties. Thus the *Diary*, in which he recorded his experiences, and left in the hands of Mr. Henry Reeve for publication after his death, is a highly important historical document. It was given to the world in three divisions. The first, dealing with the reigns of George IV. and William IV., appeared in 1875; the second, extending from 1837 to 1852, was published ten years later; and the last, bringing the memoirs down to 1860, in 1887.

Grévy, FRANÇOIS PAUL JULES (1813-91), third President of the third Republic, was born at Montsous-Vaudrey in the Jura. He adopted the profession of an advocate, and appeared in many political cases as the defender of Republicans. In 1848 he was returned to the Constituent Assembly, where he usually voted with the Extreme Left. He was a frequent speaker, and became Vice-President of the Assembly. He opposed the designs of Louis Napoleon, and after the *coup d'état* withdrew for a time from public affairs. In 1868, however, he returned to the Assembly, and opposed the Empire in its last days. In February, 1871, he was elected President of the Assembly, and was re-elected in 1876, 1877, and 1879. He opposed MacMahon as he had Louis Napoleon, and was elected as his successor in the presidency of the Republic in January, 1879. Though not inspiring much enthusiasm, he was re-elected in 1885 by a large majority, but resigned in December, 1887, owing to the discovery that his son-in-law, M. Wilson, had been trafficking in decorations.

Grey, CHARLES, 2ND EARL (1764-1845), statesman, belonged to a Northumberland family. He was educated at Eton and Cambridge. Entering Parliament in 1786, he attached himself to the party of Fox, and took part in the impeachment of Warren Hastings. He gave his support to the Society of the Friends of the People, which advocated Parliamentary reform; but his motion for inquiry into the matter in 1792 and 1793, and his scheme of reform in 1797, all fell to the ground. Meanwhile he maintained a constant opposition to Pitt's Government, and brought forward a motion for his impeachment. In 1806 Grey, now Lord

Howick, became First Lord of the Admiralty in the Fox-Grenville Ministry, a post which he soon exchanged for that of Foreign Secretary, becoming at the same time Leader of the House of Commons. He succeeded in passing a Bill abolishing the slave trade; but the difficulties that arose in regard to the Catholic Relief question resulted in the fall of the Ministry (1807). During the same year he succeeded to his father's earldom. After refusing to join Canning in 1827, he became Prime Minister and First Lord of the Treasury in the reforming Cabinet formed on the accession of William IV. The first Reform Bill, brought forward in March, 1831, was rejected in the Commons; the second passed safely through the new House, which met in June, but was thrown out by the Lords in October; in 1832 the third was read a second time in the Upper House, but, in consequence of the success of Lord Lyndhurst's motion to postpone the disfranchising clauses until the enfranchising clauses had been discussed, the Ministry resigned. On the failure of Wellington to construct a Cabinet, Grey returned to office, the king having given a written promise to create enough new peers to pass the Bill, and Wellington having withdrawn his opposition. On June 4th the Bill was accepted by the Lords. The passing of this Bill was the crowning achievement of Grey's political life, which derives its main interest from his unswerving fidelity to the cause of Parliamentary reform. Henceforward he found himself out of sympathy with the advanced views of his more Radical colleagues; and, after passing an Act for the abolition of negro slavery in the colonies, he resigned in July, 1834.

Grey, SIR GEORGE (1799–1882), statesman, was a nephew of Earl Grey. Soon after his entrance into Parliament (1832) he became Under-Secretary for the Colonies (1834–39), and as such delivered some forcible speeches in support of the action of the Government in Canada and Jamaica. As Home Secretary under Lord John Russell (1846–52), he showed both firmness and judgment in his method of dealing with the Chartist agitation. In 1849 the disturbed state of Ireland forced him to introduce a Bill suspending the Habeas Corpus Act. After holding office as Colonial Secretary under Lord Aberdeen (1854), he became Home Secretary in the first and second Ministries of Lord Palmerston (1855–58, 1859–65). During this period he introduced several reforms in matters of prison discipline, improving the ticket-of-leave system, and passing the Prison Ministers' Bill, which provided that Nonconformists should be attended by their own ministers. Sir George Grey remained in office under Earl Russell, but resigned in 1866.

Grey, SIR GEORGE, K.C.B. (b. 1812), Colonial administrator, entered the army in 1829, but retired after ten years' service. From 1837 to 1840 he was engaged in exploring Western and North-western Australia. He became Governor of South Australia in 1841, of New Zealand in 1845, and of Cape Colony in 1854. During a second residence in New Zealand as governor (1861–67) he brought the Maori War to a successful termination. He was appointed superintendent of West Auckland in 1875, and was

Premier of New Zealand 1877–84. He has been very successful in establishing friendly relations between the natives and the white population.

Grey, HENRY, 3RD EARL (b. 1802), eldest son of the 2nd Earl, first entered Parliament in 1826. He was Secretary for War 1835–39, and Colonial Secretary 1846–52. He afterwards opposed the Crimean War and the Eastern policy of Lord Beaconsfield. He has published *The Colonial Policy of Lord Russell's Administration* (1853), his father's *Correspondence with William IV.* (1867), etc.

Grey, LADY JANE (1537–54), was the eldest daughter of Henry Grey, Marquis of Dorset. Her mother was the Lady Frances Brandon, daughter of Charles Brandon, Duke of Suffolk, and Mary, sister of Henry VIII. She was born at Bradgate, her father's seat in Leicestershire, and was brought up by her parents in a very strict manner. At an early age she evinced extraordinary talent, and made great progress in Latin, Greek, Hebrew, Italian, and French, under her tutor, Aylmer, afterwards Bishop of London. She was also a skilled musician. Roger Ascham has left a well-known description of her home-life, telling how he found her reading Plato in solitude while the rest of the family were hunting in the park. After her father's elevation to the dukedom of Suffolk (1551) she passed much of her time at court. During Edward VI.'s last illness the crafty John Dudley, Duke of Northumberland, formed a scheme for securing the succession to his own family by uniting the Lady Jane to his fourth son, Lord Guildford Dudley. The marriage was solemnised in May, 1553. By exciting Edward's religious prejudices, Northumberland succeeded in inducing him to name Jane his successor; and on July 9th, three days after his death, she was proclaimed queen, much against her own will; but the people remained loyal to the Princess Mary, and after a nominal reign of nine days Jane was placed in the Tower. After remaining there for four months she was beheaded, together with her husband, on Tower Hill.

Greyhound, a large variety of the domestic dog, and one of the oldest forms, for it is figured on Egyptian monuments that are about five thousand years old. Greyhounds hunt by sight, and have long been bred for speed for coursing (q.v.), and to this quality, and in a less degree to courage, due to a strain of bull-dog blood, everything else has been sacrificed. A greyhound should stand about 24 inches at the shoulder; the head should be wide and flat with powerful jaws, the eyes dark and bright, the ears small and fine, the neck long and muscular, the shoulders sloping and very muscular, the chest deep and wide, the back square, beam-like, and long; the loins well-developed, the fore-legs well set under the body, the feet rounded with large soles, the hind-legs well bent at the hocks, and the stern fine, long, and curved. The usual colours are black, red-white, brindled, fallow, fawn, or a mixture of some of these, but no good dog is of a bad colour.

Greywacke, a half-translation of the German *grauwacke*, the name of a rock, generally grey,

though sometimes black or brownish, compact, with rounded or subangular grains and fragments of quartz, felspar, slate, etc., in a cement, usually siliceous, but sometimes argillaceous, calcareous, or anthracitic; though, when fine-grained, it resembles crystalline rocks, greywacke is of aqueous origin. It is sometimes ripple-marked or sun-cracked, being, in fact, a Palæozoic near-shore deposit; but it is much indurated by pressure and often cleaved or otherwise altered. It forms so large a part of the Cambrian, Ordovician, and Silurian systems (q.v.) that at one time they were known as the Greywacke series.

Gridiron Pendulum is a special form of pendulum constructed so that its period of oscillation shall be independent of variations in temperature. This period depends on the distance of the centre of gravity of the pendulum from its point of support, and in the ordinary type of pendulum this is increased by expansion of the pendulum rod when the temperature rises, the effect being to make the pendulum oscillate more slowly. In the gridiron form, which is due to Harrison, the downward expansion of the central bar, which may be of iron, is compensated by the upward expansion of two lateral bars of another metal such as zinc, whose expansion coefficient is greater. These are supported on a cross-piece fixed transversely at the lower end of the central bar. These lateral pieces support another cross-piece at their upper extremity which may again carry a pair of iron bars from which the pendulum bob hangs. If the upward expansion of the zinc be not sufficient to balance the downward expansion of the iron, further addition of pairs of bars of zinc and iron must be added till the required ratio between the length of iron and of zinc be obtained. The mercurial pendulum (q.v.), due to Graham, is a much more compact arrangement for compensation on the same principle.

Grieg, EDVARD HAGERUP (b. 1843), an eminent modern composer, who has given a new impulse to Scandinavian music. He was born at Bergen, and, after studying at the Leipzig Conservatorium and at Copenhagen, became director of the Musical Association at Christiania in 1867. His works include various orchestral suites, a piano concerto with full orchestra, some piano sonatas, duets for violin and piano, and some beautiful songs. He visited England in 1889.

Grierson of Lag, SIR ROBERT (d. 1733), was steward of Kirkcudbright in the reign of Charles II., and distinguished himself by his cruel persecution of the Covenanters.

Griesbach, JOHANN JAKOB (1745-1812), German theologian, was born in Hesse-Darmstadt. He became extraordinary professor of theology at Halle in 1773, and in 1776 ordinary professor at Jena, where he was afterwards rector. His chief work was his critical edition of the New Testament, which appeared in 1774.

Griffin, a fabulous monster, described by Ctesias as a four-footed bird, dwelling in the mountains of India, of the size of a wolf, but with legs and claws

like a lion. The feathers on the body are black, but those on the breast are red. In heraldry it is usually described as half-eagle and half-lion. It is composed of the head, neck, wings, legs and talons of the former, conjoined to the body, tail, and hind legs of the latter; but the head, unlike that of the eagle, is adorned with a pair of ears. It probably owes its origin to the ancient armorial practice of dimidiation. It occurs in heraldry in most of the ordinary positions of the lion, but when the griffin is placed in the position known as "rampant," it is then always termed "*segreant*." The sex of this creature is not determined, but there exists in heraldry another equally chimerical conception known as the "male griffin," differing from the "griffin" only inasmuch that it is deprived of wings and is adorned with spikes at various points about its body.

Griffin, GERALD (1803-40), a novelist, born at Limerick, settled in London in 1823. His novels, among which *The Collegians* (1828) (on which was founded the play *The Colleen Bawn*) was the most successful, are now little read. He eventually entered the Society of the Christian Brothers at Cork.

Grig. [EEL.]

Grillparzer, FRANZ (1791-1872), Austrian dramatist, was born in Vienna. In 1813 he entered the service of the government, from which he retired in 1856, after holding the post of Keeper of Archives at the Ministry of Finance for 23 years. In 1817 his first tragedy, *Die Ahnfrau*, was acted with much success in Vienna. *King Ottocar* (1822) was also well received, but his great classical dramas *Sappho* (1819) and *The Golden Fleece* (1821) are not well adapted for the stage.

Grilse. [SALMON.]

Grimaldi, JOSEPH (1779-1837), comedian, the son of an Italian dancing-master, was born in London. He appeared at Drury Lane theatre before he had completed his second year. His *Memoirs* were edited by Charles Dickens, who describes him as "the genuine droll, the grimacing, filching, irresistible clown."

Grimm, FRIEDRICH MELCHIOR, BARON VON (1723-1807), a German man of letters, was born at Ratisbon. He went to Paris as tutor to the Count de Schomberg, and there became intimate with Rousseau and the Encyclopædists. His literary correspondence with the Duke of Saxe-Gotha and other German princes, which grew out of this connection, displays much critical acumen in its judgments on contemporary French literature. In 1776 Grimm became the minister-plenipotentiary of the Duke of Saxe-Gotha in France, and in 1795 he was employed by Catherine II. of Russia as her minister at Hamburg. He died at Gotha.

Grimm, JAKOB LUDWIG KARL (1785-1863), and WILHELM KARL (1786-1859), philologists and antiquaries, were the sons of a public notary at Hanau. The brothers remained together throughout almost the whole of their lives. At the university of Marburg, where they studied law, they fell

under the influence of Savigny. In 1808 Jakob was appointed librarian to Jérôme Bonaparte, King of Westphalia, who held his court near Cassel, and thither he was followed soon afterwards by his brother. The natural bent of the brothers towards the study of folklore and old legends received a fresh impulse from the friendship formed by Wilhelm with some of the leaders of the romantic school, and in 1812 appeared the *Kinder-und Haus-Märchen*, consisting of the fairy tales they had collected, mainly in the wild districts in the neighbourhood. This volume has become a household favourite in every country of Europe, and has also done much to promote the scientific study of folklore. Jakob was present as Secretary of Legation at the Congress of Vienna, and in 1815 was sent to Paris to recover the MSS. and art treasures stolen by the French. In 1816 he became second librarian in the Cassel museum, where his brother already held a post. Here they remained until 1828, publishing their collection of *German Sagas* in 1816-18. In 1819 appeared the first volume of Jakob's *German Grammar*, the second edition of which (1822) contained the enunciation of Grimm's law (q.v.). In 1828 the brothers removed to Göttingen, Jakob as Professor of German Literature, Wilhelm as sub-librarian. Jakob's *German Mythology* was published in 1835. In consequence of their protest against the unconstitutional measures of King Ernest Augustus, they were banished from Hanover in 1837. In 1840 they were invited to Berlin. They now undertook the gigantic *German Dictionary* which is still incomplete. Jakob's *Grammar* and *Mythology* were epoch-making works in their respective spheres. Of Wilhelm's independent writings the most important was the *German Heroic Sagas* (1829.)

Grimm's Law, the law regulating the interchange of consonants in the Aryan languages (q.v.). Though to some extent anticipated by Rask and others, the discovery was first embodied in a definite law by Jacob Grimm in the 2nd edition of his *German Grammar* (1822). The rule is that an aspirate in Sanskrit, Greek, Latin, Keltic, Slavonic, and Lithuanian corresponds to a flat mute in the Low German and Scandinavian and a sharp mute in the Old High German and kindred Teutonic dialects; a flat mute in Sanskrit, etc., to a sharp mute in Low German and an aspirate in High German; a sharp mute in Sanskrit, etc., to an aspirate in Low German and a flat mute in High German—as exemplified in the following table:—

Sanskrit.	Latin.	Gothic.	O. H. Ger.	English.
dhvāra	fores	daur	tor	door
dasan	decem	tailhun	zehan	ten
tvam	tu	thu	du	thou

The law applies equally to dentals, labials, and gutturals. It does not always hold good, as it may be interfered with by the action of other laws. Dr. Morris in his *English Accidence* remarks that “no satisfactory explanation has yet

been given of this permutation of consonants throughout the Indo-European family of languages.”

Grimmelshausen, JOHANN JAKOB CHRISTOF VON (d. 1676), a German novelist, whose works give a vivid impression of the social condition of Germany after the close of the Thirty Years' War. Grimmelshausen had himself served in the war, and afterwards strolled from place to place, finally settling down as bailiff to the Bishop of Strasburg. His materials were thus largely drawn from his own experience. His best work is his *Simplicissimus* (1669).

Grimsby, GREAT, a Parliamentary and municipal borough, seaport, and market-town in Lincolnshire, 30 miles N.E. of Lincoln. It is situated at the mouth of the Humber, about 7 miles from the North Sea. The town, as the name denotes, dates from the period of the Danish occupation. It was a thriving port as far back as the reign of Edward III., and contributed ten ships to the siege of Calais. Since the construction of the new docks in 1849-58 it has become the chief fishing centre on the east coast. Cod and herrings are conveyed in large numbers to the great manufacturing towns by means of the Great Northern and the Manchester, Sheffield, and Lincolnshire railways. The inhabitants are also engaged in ship-building, and there are tanneries, breweries, and ropewalks.

Grindal, EDMUND (1519-83), Archbishop of Canterbury, was born in the parish of St. Bees, Cumberland. He was educated at Cambridge, where he became fellow (1538) and vice-master (1549) of Pembroke Hall. He remained in Germany during the reign of Mary. In 1559 he was appointed Bishop of London, whence he was translated to York in 1570 and to Canterbury in 1575. In 1577 he was suspended for refusing to prohibit “propheysings,”—i.e. meetings of the clergy for the purpose of expounding the Scriptures—but he was reinstated the year before his death.

Grindelwald, a valley of Switzerland in the Bernese Oberland, 36 miles S.E. of Berne. The valley, famous for its beauty, lies at the foot of the Eiger, Mettenberg, and Wetterhorn mountains, and forms the approach to the Upper and Lower Grindelwald glaciers.

Gringoire, PIERRE (d. 1544), a French poet, said to have been born at Caen. He was the chief member of the theatrical company called “Enfants sans Souci,” but his later poems deal with religious themes only. His chief compositions were *Le Jeu du Prince des Sots*, a satire against Pope Julius II. (1511), *Les Folles Enterprises*, allegorical pieces in which he sets forth the abuses in Church and State, *La Chasse du Cerf des Cerfs*, a political satire, and the *Mystère de Monseigneur Saint-Loys*.

Griping. [COLIC.]

Griqualand, the name of two British possessions in South Africa, so called from the Griquas, a mixed race sprung from the Dutch and Hottentots. GRIQUALAND WEST has formed a part of Cape Colony since 1880. It is bounded by Bech-uana Land on the N., the Orange River Free State

on the E., the Kalahari desert on the W., and the Orange River on the S. The diamond-fields have been worked continuously since their discovery in 1867, and are still a source of great wealth. GRIQUALAND EAST, situated between Kaffraria and Natal, was annexed to Cape Colony in 1875. It is governed by a chief magistrate with nine assistants.

Griquas, a Hottentot people, South Africa, with a large strain of Dutch blood, hence called *Baastards* by the Boers. There are two divisions, those of Griqualand West and Griqualand East, both now comprised within Cape Colony, and subject to British administration. At the beginning of the eighteenth century they already formed numerous tribal groups settled in the Roggevelde uplands, from which they were driven beyond the Orange river by the English settlers about the year 1820. Here some established themselves in the present district of Griqualand West, while others moved up the right bank of the Orange, and in 1852 crossed the Drakenberg range and settled under their leader, Adam Kok, in the district of Kafirland, south of Natal, now known as Griqualand East. They are a harmless, industrious people, mostly Christians of Dutch speech, but physically of unmistakable Hottentot type. (Livingstone, *Missionary Travels*, 1852; Silva White, *Handbook of South Africa*, 1880.)

Griselda. The story of "patient Grisild," immortalised by three great writers of the 14th century, cannot be traced farther back than Boccaccio. In the *Decamerone* it is the last tale told on the 10th day, thus closing the series. In or about 1373 Petrarch wrote his *De obedientia et fide uxoria Mythologia*, with a prefatory letter of admiration addressed to Boccaccio. Chaucer closely follows Petrarch, whose version differs in some respects from that of Boccaccio. As Petrarch was in the habit of narrating the story in conversation, Chaucer may have learnt it from him orally during his visit to Italy in 1373 as well as from his written version. So much at least may be gathered from the allusions to Petrarch in the prologue to the *Clerkes Tale*. Moreover, the mention of Petrarch's death as a recent event, as well as other internal evidence, shows that the *Clerkes Tale* was written a considerable time before it was embodied in the *Canterbury Tales*. The Clerk tells how Griselda, the daughter of a humble retainer of the Marquis of Saluzzo, won that lord's affection by her maidenly virtue and her loving care of her aged father; how when he was importuned by his vassals to marry, Griselda became his bride; how to test her constancy he deprived her of her children and sent her home in disgrace, and how, when she remained true to him through all, he received her back with the assurance that he indeed possessed the model of a perfect wife. Among other versions of the tale may be mentioned *Le Mystère de Griseldis*, acted in Paris in 1393, the prose version in *Le Ménagier de Paris* of about the same date, Lydgate's mention of Griselda in the *Temple of Glass*, several English ballads, and two plays of the 16th century, including one by Dekker, Chettle, and Haughton.

Grisi, GIULIA (d. 1869), operatic singer, was born at Milan in or about 1810. After performing with success at Florence, Pisa, and Milan, she made her *début* at Paris in 1832 as Semiramide in Rossini's opera. In 1834 she appeared in London, which henceforward became her home. Among her chief rôles were Adalgisa in *Norma*, Desdemona in *Otello*, and Amina in *La Sonnambula*.

Grison (*Galietis vittata*), a large South American weasel lighter on the upper than on the under surface.

Grisons, GRAUBÜNDEN, the largest and most easterly of the Swiss cantons, lies between Tyrol on the north and Como and the Valtelline on the south, and is 80 miles in length by 45 in width, and contains 2,963 square miles. Most of the canton belongs to the Alpine region formerly known as the Rætian Alps, and, except in the valley of the Rhine and in the valleys upon the Italian side, has a thoroughly Alpine climate and scenery, about one-tenth of the surface being occupied by glaciers. There are five groups of glaciers, one of which contains the chief source of the Rhine. The principal valleys are the Engadine, or Upper Inn valley, and the Vorder and Hinter Rheinthal, which latter, with side valleys opening from them, form the Upper Rhine basin. There are also the valley of the Upper Inn, and the Italian river valleys of Misocco, Bregaglia, and Poschiavo, which are more or less fertile, the most fertile regions being the Prättigau and the Rheinthal below Ilanz. The Rheinthal below Chur produces good wine, and the Italian parts produce maize and chestnuts, and the other ordinary produce of the region, and the Poschiavo valley produces good tobacco. There is also some export of Valtelline wines. The scenery of the inner regions is wild, and there are some lofty points, Piz Bernina rising to a height of over 13,000 feet. The Upper Engadine and Davos are coming into vogue as health-resorts for consumptive patients, the dry clear air being very beneficial in cases of this sort. Mineral springs are numerous. In the upper regions crops ripen with difficulty or not at all, but there is an abundant hay-harvest, and the forests are a source of wealth, while the pastures support many cows on the lower slopes and sheep upon the upper. There are several good and long-known passes through the Rætian Alps. In many parts the Romanisch dialect—probably a relic of the *lingua rustica* of Rome—is spoken, though German is generally understood. Many of the inhabitants migrate to other parts of Europe to swell the great army of Swiss confectioners and café proprietors, but usually return when they have acquired a competence.

Grit, a coarse-grained sand or, more often, sandstone. The Silurian grits of Denbighshire and of the Coniston district and the Millstone grit of the Middle Carboniferous are well-known examples of this rock.

Grizzly Bear (*Ursus ferox*), from the Rocky Mountain region, the most carnivorous and ferocious species of the genus. The fur is dark brown, and adult males attain a length of nearly nine feet.

Groat, a mediæval coin worth fourpence. The name is derived from the old Low German word *grote*, "great," which is said to have been used in the first instance to describe certain coins of Bremen of a larger size than was usual. The first English silver groats were coined in the reign of Henry III. The coinage ceased in 1662.

Grodno, a western government of Russia, lying between lat. 52° and 54° N., and long. 23° and 26° E., having Wilna to the north, Minsk to the east, Volhynia to the south, and the old kingdom of Poland to the west, and containing about 15,000 square miles. The region consists for the most part of an alluvial sandy plain, in places swampy, in others covered with pine-forests, ill-fitted for the growth of fruit or vegetables, but producing fair crops, cattle, and bees; and there is a not inconsiderable export of grain, wool, cotton, and timber. The climate is misty, damp, and cold. One of the forests is said to contain bison. The principal rivers are the Niemen, Narev, Bobia, and Bug, and there are many canals. The town of Grodno, on the right bank of the Niemen, is the seat of the provincial government, and has a fine government office, and two palaces of the Kings of Poland. Here it was that the last King of Poland abdicated. There is railway communication with St. Petersburg, Moscow, and Warsaw.

Grog, in the navy, a mixture of spirit and water, served out in that form to prevent intoxication. The proportion, if the spirit be rum, is usually two parts of water to one of rum. Grog probably takes its name from Admiral Vernon, who introduced the practice of mixing, and who was known in the service as "Old Grogam."

Grolier, JEAN (1479-1565), was a noted French book-collector. He accompanied the army of Francis to Italy, and did diplomatic service at Milan and Rome. His library, which was scattered about the middle of the 17th century, numbered about 3,000 well-chosen books, bound in the special style known by his name, and some 350 of these have been recovered.

Gromidæ, a family of Foraminifera, which are provided with a horny or chitinous shell (or test); there is an aperture at one or both ends for the protrusion of the pseudopodia.

Groningen, a town and province of the Netherlands, at the junction of the Hunse and the Aa, and nearly 50 miles east of Harlingen. The old town is surrounded by a ditch, crossed by eighteen bridges, and there are several open spaces, the largest of which is the Breedemarkt. Five of the principal streets are named after old local families. Among the chief buildings are a town hall, provincial administrative offices, a well-appointed university, and twelve churches, the chief of which are St. Martin's, the Aa church, and the New Church, and an institution for the deaf and dumb. There is a good trade, and among the industries are cotton and woollen-weaving, flax-spinning, rope, salt, beer, vinegar and soap-making, and gold and silver-working. The town is of great antiquity.

Gronovius, JAKOB (1645-1716), was a Dutch scholar, born at Deventer and educated at Leyden. He afterwards visited England, and collated MSS. at Oxford and Cambridge. In 1679 he edited Polybius, and then visited France, returning later to Leyden, and then going to Spain and Italy, in which country he did professional work for two years at Pisa. He then returned to Deventer, but was shortly made professor at Leyden, where he passed the rest of his life. Besides his chief work, *Thesaurus antiquitatum Græcarum*, he edited many of the classical authors.

Gros, ANTOINE JEAN, BARON (1771-1835), was a French painter who occupied in art an intermediate place between the classical and the romantic schools. He was born at Paris, where his father was a miniature painter, and in 1785 began to study under David. He was with Napoleon in Italy, and one of his subjects was Napoleon on the bridge at Arcola. His principal works were *Les Pestiférés de Jaffa*, *The Battle of Aboukir*, and *The Battle of Eylau*, and he had many pupils in his palmy days. Latterly his work fell off in quality, and eventually he committed suicide. Napoleon made him baron of the Empire.

Grosbeak, a name for any finch of the genus *Coccothraustes*, from the size of the bill. The Hawfinch (q.v.) is a good example. The term is also applied to the Cardinal (q.v.).

Grose, FRANCIS (c. 1731-1791), an English antiquary, was born at Greenford in Middlesex, where his father, of Swiss extraction, was a jeweller. He studied art, and his first drawing of note was entitled *High Life below Stairs*. In 1769 he began to exhibit tinted and other drawings at the Academy, many of them being architectural, and illustrated many of his own works. In 1757 he became Richmond herald, and in 1757 F.S.A. He was also adjutant of the Hants militia, and at a later period captain and adjutant in the Surrey militia. In 1787 he published *Antiquities of England and Wales*, and in 1789-91 *Antiquities of Scotland*. His visit to Scotland made him acquainted with Burns, who alluded to him in "A chiel's amang you taking notes, and faith he'll prent 'em," as well as in other poems. A projected work on the antiquities of Ireland was cut short by his death. He published also many other works.

Grossetete, ROBERT (d. 1253), was a Bishop of Lincoln (1235-53) noted for his reforming zeal and his energetic qualities. He was of humble birth, and was educated at Oxford and perhaps at Paris, becoming in 1224 rector of the Franciscans at Oxford. He was renowned as a preacher and an exponent of Aristotle. He held many preferments, but in 1231 resigned them all save a prebend in Lincoln cathedral. There was a difficulty about the place of his consecration in 1235, Reading being finally chosen for it. He at once set about visiting and reforming his diocese, being especially severe upon the monasteries. He was present at the signing of the Great Charter, and in 1239 he quarrelled with his Chapter as to his right of including them and their patronage in his visitations. This point

was decided in his favour by the Pope, but he soon became involved in a quarrel with the Abbot of Westminster, another with the king, and another with the Chapter of Canterbury as to their powers during a vacancy of the archiepiscopal throne. In 1244 he laid the foundation of the exceptional judicial powers of the Chancellor of Oxford. In his quarrels he appealed to the Pope, and during a visit to his Holiness at Lyons he inveighed in a sermon against the corruption and venality that prevailed at the Papal Court. There is a notable letter of his extant in which he temperately, but firmly, refused to obey the Pope on a matter where he thought the latter was in the wrong. He left behind him many works both philosophical and scientific. Froude has drawn a good picture of him in his *Short Studies*.

Grosventres ("Paunch"), the Franco-Canadian name of the Hidatsa branch of the Minnetaree Indians, and applied generally to all the Minnetarees. These are the Fall Indians of English writers, who formerly ranged from the Upper Missouri to the South Saskatchewan river. They appear to be most nearly related to the Upsarokas (Crows) of the Yellowstone basin, who are a branch of the Dakota family; but by some ethnologists they are classed with the Arapahoes, who are an outlying branch of the Algonquin stock. They are now either extinct or grouped in reservations with other broken tribes; but the name survives in the Grosventres river, southernmost of the three head streams of the South Saskatchewan.

Grote, GEORGE, D.C.L., LL.D. (1794-1871), a noted historian and philosopher, was born near Beckenham, his grandfather being a German from Bremen who established himself first as a merchant, then as a banker, in London. George Grote was educated first at Sevenoaks and then at Charterhouse, where he had for contemporary Connop Thirlwall, though their friendship did not begin till a later period. At the age of 16 he had to enter his father's bank, but continued his classical studies, to which he was devoted, and gave much attention also to German, political economy, music, and philosophy. In 1820 he came under the influence of the Bentham-Mill school of thought, an influence which had a great effect in moulding his own views, while he in his turn exercised much influence upon John Stuart Mill. In 1821 he wrote a pamphlet upon Parliamentary Reform, and in 1822 *An Analysis of Natural Religion upon the Temporal Happiness of Mankind*, which was in a great measure founded upon some MSS. of Bentham. In 1820 he had already taken up the idea of writing a history of Greece, and in 1826 an article of his in *The Westminster Review* upon Mitford's *History of Greece* foreshadowed his line of treatment. Meantime, he, with Mill and others, was greatly interested in the project of founding a London University, though there was some friction between him and them as to filling the professorial chairs. In 1830 he was in France and displayed practical sympathy with the revolutionary cause. In 1831 he wrote a further pamphlet on Parliamentary Reform, and being returned to the House of Commons, sat

during three Parliaments, showing himself an ardent advocate of the introduction of the Ballot, as well as other points of reform. In 1843 he finally left the bank, and devoted himself to the great work of his life. The first two volumes of his history appeared in 1846, and the twelfth and last in 1856. This history came as a revelation to many, not only for the clearness and occasional grandeur of its style, but also for the new points of view which it took and for its marvellous insight into the problems of ancient Greek life and the methods of their settlement. Some difficulties of Swiss political life and their result in the "Sonderbund," and the similarity between them and those of ancient Greek politics, had led in 1847 to the publication in the *Spectator* of *Seven Letters upon Recent Politics in Switzerland*. In 1865 he published his second great work on *Plato and the Other Companions of Socrates*, and endeavoured to complete his estimate of Aristotle, but failure of health and death prevented this. It was published posthumously. He showed his regard for the new London University by liberal endowment.

Grotefend, GEORG FRIEDRICH (1775-1853), a German scholar, noted for his researches into cuneiform inscriptions, was born at Münden in Hanover, and educated there and at the university of Göttingen. His treatise on *Universal Writing* brought him into notice in 1799. He was well-read in Latin and Italian philology, and published a revised Latin Grammar, deciphered some Umbrian fragments, a treatise on Bactrian coins, and a work upon ancient Italy. It was in 1800 that he laid the foundations of modern progress in deciphering the cuneiform inscriptions by discovering that they were Persian, that there were three types of character, one of which was the key to another, and that they were written from left to right.

Groth, KLAUS, a Platt-Deutsch writer, was born in Holstein in 1819. For a time he taught in a school of his native place, but later travelled in Germany and Switzerland, and in 1866 became professor of German language and literature in Kiel University. Among his chief works were a poem, *Quickborn*, a collection of poems in the Ditmarsh dialect (1852), prose stories of village life, and rhymes for children. He also wrote poems in Hoch-Deutsch.

Grotius, HUGO (1583-1645), a Dutch controversialist and writer upon international law, was born at Delft, where his father was a lawyer. He was astonishingly precocious in intellect, and at the age of fifteen accompanied the Grand Pensionary and the Count of Nassau on an embassy to France. He studied here for a year, and, returning to Leyden, became a Doctor of Law, and an advocate. He was an adept in Latin verse-writing. In 1603 he became historiographer to the United Provinces, and a question which arose in the Dutch East Indies as to an alleged act of piracy in waters that the Portuguese claimed as their own property led to his writing a treatise, *De Jure Prædæ*, which, though not published till the present century, was the undoubted forerunner of his later and widely-known work. In 1610 he

published *De Antiquitate Reipublicæ Batavæ*, and was shortly afterwards Pensionary of Rotterdam. In 1613 he formed one of a deputation to England, to discuss some questions that had arisen between the two nations. In 1617, being involved in the theological dispute then raging between the Arminians and Calvinists, he came into collision with the supreme authority, and was sentenced to imprisonment in a fortress for life. By the aid of his wife he escaped in a chest which was used to bring and take away his books, and went to Paris, where in 1625 he wrote his celebrated treatise, *De Jure Belli et Pacis*, which may be looked on as the foundation of the principles of the law of nations, since then developed and systematised by Twiss, Heffter, and others. At a later period Grotius was appointed Swedish ambassador at the Court of France. There are many other works of his extant, but it is to his treatise on international law that he owes most of his reputation.

Grotthüss Theory, in *Electricity*, is a suggested explanation of the actions that take place in an ordinary battery. Given two dissimilar substances such as zinc and copper placed in a conducting liquid such as sulphuric acid, the theory is that under the action of the opposite electricities that are induced on the different metals, the molecules of the conducting liquid have each a constituent that is attracted towards one pole and another constituent attracted towards the other pole. When the circuit is closed by the poles being connected by an external conductor, this tendency for the molecules of liquid to become split up is partially satisfied. Hydrogen in the acid solution is attracted towards the copper, and oxygen, the other constituent of the water, is attracted towards the zinc. Not that hydrogen atoms stream in a free state through the liquid towards the copper pole and oxygen towards the zinc pole; but as soon as a molecule of water near the zinc is split up into its constituents, hydrogen remains there and oxygen combines with a molecule near it, throwing out a previously combined molecule of hydrogen. This seizes the oxygen from a complete molecule near and sets free another molecule of hydrogen. Thus the only free constituents exist at the poles. The theory is rather mechanical, and differs essentially from the modern idea of dissociated constituents (or ions) in the liquid conductor of electricity.

Grouchy, EMMANUEL, MARQUIS DE (1766–1847), a French general who, entering the army at fourteen, took part in the Vendéan campaign, and was appointed second in command to Hoche in the Irish expedition. He saw much service in Italy, and fought in most of the battles of the German campaign, one of his chief feats being the covering of the retreat at the battle of Leipzig. He joined Napoleon after the latter's escape from Elba, and defeated Blücher at Ligny. After Waterloo—which some of his enemies declared to have been lost through his mistake—he conducted the army back to Paris, and then went to America till 1819. In 1831 he returned to France, and was reinstated in his military rank.

Groundling, a popular name for the spinous loach (*Cobitis tenia*), from its frequenting the muddy bottom of rivers. It is distinguished from the loach (q.v.) by its long, compressed body, and the bifid erectile spine below the eye.

Ground-nut, EARTH-NUT, MONKEY-NUT, or PEA-NUT, the short, oblong, cylindrical pod of an annual leguminous plant of tropical and sub-tropical countries, *Arachis hypogæa*. After flowering, the flower-stalk bends down and buries the young pod, which ripens under ground. It has a reticulate surface, and contains one or two seeds. In sandy soil this plant will yield from thirty to thirty-eight bushels of nuts per acre. The seeds taste like almonds, and are largely eaten in many countries, over three and three-quarter million bushels being raised annually in the southern United States. On pressure the seeds yield a large quantity of a bland, yellowish, non-drying oil, an excellent substitute for olive oil. The nuts are largely imported to Marseilles for their oil, chiefly from the west coast of Africa, about 90,000 tons being received annually. They are familiar to English children as “monkey-nuts” and to Americans in “pea-nut candy.”

Ground Pigeon, a somewhat loose name for birds of the genus *Goura* (q.v.).

Ground Rent is the rent reserved by a lessor on a grant of lease. It is usually of small amount, the lease being granted for a period of ninety-nine years upon the understanding that the lessee (the builder) shall within a fixed time erect upon the ground one or more messuages of a specified description. When these messuages are built they are sublet to occupants or others, who pay an increased rent estimated to repay the lessee with a profit. The builder's rent, viz. that which he pays to the ground landlord, is termed the ground rent. The ground landlord is entitled under the statute 4 Geo. II., c. 28 to distrain on the premises for the rent, so that it is quite possible that the occupying tenant may have to pay this in addition to his occupation rent unless proper precautions be taken. In the sub-lease there should be a covenant on the part of the sub-lessor (that is, the holder of the original lease) to indemnify his lessee from such payment and to produce receipts from time to time verifying the payment of the ground rent. Also where several houses are comprised in one lease and then separately sub-leased the whole property is subject to the original ground rent and covenants unless the same have been apportioned (that is, reserved on each house). This makes the dealings with underleases very objectionable and considerably reduces the value of such property.

Groundsel (*Senecio vulgaris*), a common annual weed throughout Europe, whence it has been introduced into all temperate climates. It belongs to the sub-order Tubulifloræ of the order Compositæ (q.v.), and differs from closely allied forms such as the Cineraria (q.v.) in very seldom having any ray-florets. Its branched succulent stem grows a foot high, its leaves are irregularly pin-natifid, and its heads of yellow florets are small. It is gathered as food for cage-birds. A fungus

which attacks it, *Coleosporium senecionis*, proves to be only a stage in the life-history of *Peridermium pini*, the pine-blister, a serious disease of the leaves and bark of pine trees.

Ground Squirrel. [CHIPMUNK.]

Grouse, a book name for birds of the sub-family Tetraonidæ, from the northern parts of both hemispheres, distinguished from their allies the partridges in having the legs and toes feathered and the nostrils covered by a soft feathered skin. The males of some American species have a large dilatable sac on each side of the neck, by means of which the love calls are produced in the breeding season, while in other forms the same purpose is attained by the "drumming" made by the rapid motion of the wings. Of the type genus Tetrao, two species are British; the Blackcock and the Capercaillie (both which see). The grouse of British sportsmen—the Red Grouse of naturalists (*Lagopus scoticus*), of the same genus as the Ptarmigan (q.v.), is a native of the moors of the north of England and the lowlands of Scotland, but is less common in Ireland. The adult male bird is about sixteen inches in length and the female somewhat smaller. The plumage, consisting of shades of brown, with white and black markings, is eminently protective, and varies considerably according to the nature of the country which the birds frequent. They are generally ground birds, but instances of perching in trees are on record (*Field*, December 17, 1892). They feed on berries and seeds, heather tips, leaves, and the like. The nest is a slight structure, and usually contains from eight to ten yellowish eggs with reddish-brown markings. Grouse shooting in Britain commences on August 12, and closes on December 11. The grouse-disease has been attributed in turn to over-preservation, to the destruction of raptorial birds on the moors to such an extent that sickly game-birds survive and spread infection, and to the presence of a small nematoid worm akin to, if not identical with, that which causes gapes in chicken. The Willow Grouse (*L. albus*), common over the north of Europe, resembles the Ptarmigan in plumage, and, like that species, becomes white in winter. The Ruffed Grouse constitute the genus *Bonasia* in which the lower part of the legs is destitute of feathers and the plumage on each side of the neck erectile. Beside *B. umbellus*, which runs into several varieties, the chief American forms are the Sharp-tailed Grouse (*Pediocetes phasianellus*), with white, black, and brownish-yellow plumage, harmonising with the colour of the soil; the Prairie Hen, Prairie Chicken, or Pinnated Grouse (*Cupidonia cupido*), with two erectile tufts in the nape, and a dilatable air-bladder in shape and colour like a small orange on each side of the neck; and the Cock of the Plains or Sage Cock (*Centrocercus urophasianus*), a fine bird, but with flesh of very bitter flavour, owing its habit of feeding on the wild sage of the western plains. [SAND GROUSE.]

Grove. [ASHERAH.]

Grove, SIR GEORGE, was born at Clapham in 1820. He was trained as an engineer, and took

part with Robert Stephenson in building the Britannia Bridge, and also built some iron light-houses in the West Indies. He afterwards became secretary to the Society of Arts, and, later, to the Crystal Palace Company. He also edited *Macmillan's Magazine*, edited and partly wrote a *Dictionary of Music and Musicians*, and in 1883 was knighted and appointed Director of the Royal College of Music. He has also directed his attention to the East and Bible history, aiding Dean Stanley in his researches, joining in the Palestine Exploration scheme, and contributing to the *Dictionary of the Bible*.

Grove, SIR WILLIAM ROBERT, born 1811 at Swansea, was educated at Brasenose College, Oxford, and was called to the Bar in 1835, was appointed Judge in 1871, and retired in 1887. He studied deeply electricity and optics, and was for a time professor of natural science at the London Institution. In 1866 he was President of the British Association. In 1839 he invented the battery which was called after him, and he has lectured and written on the correlation of physical forces, and many other points of physical science.

Grove Cell is a good form of primary battery possessing the advantages of high and constant electromotive force and low resistance. Its disadvantages are that noxious fumes are given off when the battery is working and that the cell is expensive. It is a double-fluid battery, consisting of a zinc plate immersed in dilute sulphuric acid in an outer earthenware vessel and a platinum sheet in an inner porous pot containing strong nitric acid. The zinc, dissolving, causes the production of zinc sulphate and hydrogen. This latter gas is prevented from producing a back electromotive force that would diminish the efficiency of the battery, by passing through the porous vessel into the nitric acid. Here it is oxidised and converted into water, nitric oxide gas being evolved at the same time. The E.M.F. produced is nearly two volts, and if the inner pot be flat-sided and the slab of zinc bent round so as to surround the porous pot, the internal resistance of the battery may be made very small. Bunsen's modification consists of the introduction of a slab of carbon in the place of the platinum sheet. The E.M.F. is a trifle higher, and the cell is much cheaper.

Growler (*Grystes salmonoides*), a food-fish of the Perch family from the rivers of the United States. It is about two feet long, dark olive above and greyish-white beneath. Its name refers to the noise it makes when taken out of the water. For the same reason sea-perches of the American genus *Hæmulon* are also called Growlers.

Growth (in plants) implies the building up of new organic substance from the food, a change of form, and generally a permanent increase in bulk. It may be said, therefore, to begin in the protoplasm. Its pre-requisites are (1) water, to maintain the turgidity of the cells; (2) a favourable temperature; (3) a supply of the chemical constituents of protoplasm, especially carbonaceous and nitrogenous matters; (4) and in the case of

aërobiotic plants (q.v.) oxygen for respiration; or, in that of anaërobiotics, fermentable material. The mere stretching of cells from increasing turgidity is not growth; but when the stretching of cell-walls is accompanied by their thickening it becomes permanent, and may well be considered as growth. The growth of organs as a whole may be mainly considered as either elongation or increase in girth. Within certain limits a rise in temperature increases the rate of elongation both of shoots and roots; but in nature roots are often so deep as to be practically removed from the varying influence of the sun's heat and then grow continuously. Light is not essential to growth, but has in general a retarding influence, as is seen by the arching of the stems of plants in a window towards the light, their illuminated sides growing more slowly. The entire absence of light, however, stops the chlorophyllian action, and so cuts off one of the main sources of plastic or growing material. Growing organs seem to possess an inherent *rectipetality* or tendency to grow in a straight line, and any *heteranxiosis* or inequality in growth seems to be the result of the varying action of external influences, especially light, gravity, moisture, and contact. From this point of view organs may be divided into those which are *cylindrical*, with *radial symmetry*, such as roots, shoots, or the leaves of rushes and onions, those which are *bilateral* or are *flattened vertically*, as the leaves of *Iris*, and those that are *dorsi-ventral*, or flattened horizontally, with a contrasting structure on their upper and under surface, as most leaves. The first of these groups, from growth taking place in succession on every side, exhibits *circumnutation*, a nodding or revolving spiral growth. The second group move their growing points in a zig-zag. Dorsi-ventral organs elongate first on one surface and then on the other; but seldom alternate the side more than once or twice. When their upper surfaces grow faster growth is said to be *epinastic*; when the lower, *hyponastic*. Fern-leaves, for example, are at first strongly hyponastic, and so become rolled up in the bud; but afterwards, becoming epinastic, the leaves unfold. The directive influence of light is termed *heliotropism* (q.v.); that of gravity, *geotropism* (q.v.); that of moisture, *hydrotropism*. The action of contact is especially seen in tendrils (q.v.) and climbing plants. Of growth in thickness the most important cases are those of roots (q.v.) by means of a *pericambium*, adding to both xylem and phloem internally and to the cortical tissue externally; of the stems of *Aloë Yucca*, *Dracæna*, and other arborescent Monocotyledons (q.v.), in which a *pericycle*, or zone of fundamental tissue, remains merismatic and gives rise to new but closed fibro-vascular bundles; and of the exogenous stems of Gymnosperms (q.v.) and Dicotyledons (q.v.), in which a *cambium* zone, partly fascicular and partly inter-fascicular in origin, gives rise to rings of xylem internally, generally annually, and to phloem externally.

Grub Street, originally a street near Moorfields in London (now Milton Street), where many hack-writers and scribblers lived. The term thus

became applied to this class of persons in their collective capacity.

Grundtvig, NIKOLAI FREDERIK (1783–1872), was a Danish poet and politician. He was born at Udby, and educated at Aarhus, entering in 1800 the university of Copenhagen. He studied Icelandic, and, obtaining an appointment as private tutor, he turned his attention to Shakspeare, Schiller, and Fichte. He took orders, and wrote some controversial works, and took an active interest in politics prior to the war with Prussia. He came to England, and studied Anglo-Saxon, one result of this being the publication in 1840 of an Anglo-Saxon poem, *The Phoenix*, with a Danish translation. Others of his works are a treatise on the songs of the Edda, *Northern Mythology* (1808), *Decline of the Heroic Life in the North* (1809), *Songs for the Danish Church* (1837), and *Selections of Ancient Scandinavian Verse* (1838).

Grus, Gruidæ. [CRANE.]

Guacharo (*Steatornis caripensis*), a nocturnal fruit-eating South American bird, allied to the Goatsucker (q.v.). The total length is about 21 inches, plumage reddish-brown, deeper above, and marked with white spots, some of which are surmounted by a black line. These birds were discovered by Humboldt in 1799 in the cavern of Caripe, where they congregate in vast numbers. The young are slaughtered for their fat, which, when clarified, is used as butter, and will keep good for a long period.

Guadalajara. 1. A province and town of Spain in the northern part of New Castile. The province contains 4,800 square miles, and, with the exception of the north, where are some heights of the Guadarrama range, is somewhat level, and forms part of the basin of the Tagus, to which flow the Henares and other tributaries. The soil is mostly good, affording pastures on the uplands, oak and cork trees on the heights, and in the lower parts cereals and other crops—among the productions being silk, saffron, and flax. There is an export of sheep, wool, barley, wheat, oil, and wine. Iron is worked, and lead is produced in small quantity. The town, which is the capital of the province, is on a height near the Henares, which is crossed by a stone bridge whose foundations are of Roman construction. Guadalajara is 38 miles N.E. of Madrid, and is supplied with water from a Roman aqueduct. There are promenades, many churches and convents, a fine ducal 15th century palace, and a magnificent burial-place—Panteon—of the Dukes of Mendoza. Soap, earthenware, and woollen goods are manufactured. The name is said to signify "River of Stones."

2. A city of Mexico, 280 miles N.W. of Mexico, situated at a considerable height above sea-level, and enjoying a good climate.

Guadalquivir, an important river of Spain, well supplied all the year round with water from the Sierra Nevada. Rising in the province of Jaen, it flows S.W., through Cordova and Seville, and then divides Huelva and Cadiz, and falls into the Bay of Cadiz, forming in its lower course two

islands called respectively Isla Mayor and Isla Menor. Of its 374 miles of course, 80 miles, to Seville, are navigable. Cordova is another town on its banks. With the exception of rapids in its passage through the Sierra Morena, the stream is slow, and the neighbouring region low and swampy and liable to floods. Its tributaries are the Guadajoz and Genil on the left bank, and the Guadalimar and Guadiato on the right. It figures largely in poetry, as the typical river of Spain.

Guadeloupe, a West Indian island of the Lesser Antilles, 62 miles from Martinique, and about 4,000 miles from Brest. It is French territory. A salt channel, called "La Rivière Salée," from 100 to 400 feet wide, separates the island into two parts, Grande Terre and Basse Terre. The former of these is on the W., and has a length of 28 miles from N. to S., with a width of 12 to 15 miles. The latter is 22 miles N. to S., and 34 S.E. to N.W. By a curious contradiction in terms, Basse Terre is hilly and of volcanic origin, and rises to a height of 4,870 feet, and has many streams which are liable to sudden rises during the rain storms. Grande Terre, on the other hand, is flat, and water is scarce, the inhabitants having to rely upon the ponds for their supply. The temperature is generally pleasant, but the island is liable to heavy storms, and the rainfall is excessive. Among the productions are sugar, coffee, cotton, yams, bananas, and other tropical fruits, and there is some production of tobacco, vanilla, and cloves. The town of Basse Terre, situated in the south-west portion of the island, is the capital.

Guadiana (anciently Anas), a river of Spain and Portugal, called in its upper course Zancara, rises in the E. of the province of La Mancha, and flows S.W. to a series of lakes called "Ojos," and which were formerly regarded as supplying the main stream. Then taking the name of Guadiana, it flows W. to Badajoz, and then S., forming part of the frontier, then through the Portuguese province of Alemtejo, then again to the frontier, between Huelva and Algarve into the Bay of Cadiz. It is navigable for about 40 miles from the mouth, and its chief tributaries, all of which are on the left bank of the river, are the Javalon, Matachel, Ardila and Chanza.

Gua-hû (YA-HÛ), a primitive people of Cambodia, close to the Siamese frontier, visited for the first time by Dr. Harmand in 1877. They are a timid, inoffensive people, quite distinct from the semi-civilised Bolovens of the same district; they still lead a purely nomad existence, and depend entirely on the produce of the chase.

Guaiacol, a compound of the aromatic or benzene series, which is found among the distillation products of "guaiacum" and of beech and other woods. It is hence one of the chief constituents of "wood tar." [CREOSOTE.] When pure it is a colourless liquid of specific gravity 1.12, which boils at 200° C. and possesses an aromatic odour. It has the composition $C_7H_8O_2$, its constitution being represented by the formula $C_6H_4(OH)OCH_3$, the

two radicals OH and OCH_3 being in what are known as the *ortho* position. [ISOMERISM.]

Guaiacum, a genus of tropical American trees belonging to the small order Zygophyllaceæ. The wood of *G. officinale*, a native of the West Indies and of northern South America, and to a less amount that of *G. sanctum*, a native of Cuba, Florida, and the Bahamas, is the *lignum vite* of commerce, so named from its reputation as a drug. The heartwood is of a dark greenish-brown colour, and has a specific gravity of 1.333, and will therefore sink in water; it contains 26 per cent. of resin and is so hard and cross-grained that it cannot be split. The sapwood is pale yellow, will float, and contains no resin. The wood is used for ship's-blocks, skittle-balls, mallets, string-boxes, etc. *Guaiacum resin*, which is glassy, brittle, greenish-brown, translucent, slightly balsamic and soluble in alcohol, is obtained as an exudation from the stems of these trees or by boiling the wood. It contains 70 per cent. of *guaiaconic acid* ($C_{38}H_{40}O_{10}$) and 10 per cent. of *guaiaretic acid* ($C_{20}H_{26}O_4$). It is adulterated with common resin and is used as an adulterant of jalap and scammony (q.v.). The wood was introduced into European medicine by the Spaniards in 1508, but the resin was not used until later.

The official preparations of this drug are the mixture (dose $\frac{1}{2}$ to 2 fluid oz.) and the ammoniated tincture (dose $\frac{1}{2}$ to 1 fluid drachm). Guaiacum is also a constituent principle of the well-known purgative pill known as Plummer's pill. The drug, when taken in small doses, is useful in cases of relaxed throat, and of chronic gout and rheumatism; if administered, however, in large doses it has a purgative action.

Guaicuri (GUACHIRES), a South American people, whose territory formerly comprised the north-east corner of Venezuela and the adjacent island of Margarita. They still form part of the environs of Cumana, but all now speak Spanish, and have in other respects conformed to civilised ways. They appear to have been of Carib stock, with a brown or coppery complexion. Humboldt spoke of them at the beginning of the century as being, "next to the Caribs of Spanish Guiana, the finest race of men on the mainland." Several other tribes which used to bear the same name were formerly scattered over other parts of Venezuela and Guiana; but these all are now either extinct or merged in the general Hispano-American populations.

Guainares, an Indian nation of Venezuela, whose territory lies in the Upper Orinoco basin about the sources of the Matacuni and Padamo rivers flowing to the right bank of the main stream. Like their Guaharibo neighbours and several other tribes of this region, they are noted for their light complexion, hence grouped by the missionaries amongst the *Indios blancos*, or "White Indians." But the colour is not white, but rather a light yellowish olive, such as is prevalent amongst the southern inhabitants of Spain and Italy. (Humboldt, *Relation Historique*, viii.)

Guaipunavos, Venezuelan Indians of the Amazonas territory, on both sides of the Inirida which flows to the right hand of the Guaviare affluent of the Orinoco. The Guaipunavos were formerly a very powerful nation, ruling over nearly the whole of the vast region which now bears the name of Amazonas. Later their supremacy was disputed by the Maratibanos, who ascended the Cassiquiare from the Rio Negro, and in the struggle vanquished their renowned chief Cruseru. At present they are confined to the Inirida valley, where they bear the name of Puinabos, evidently a corrupt form of Guaipunavos. (Fr. Montolieu in *Bulletin de la Soc. de Géographie*, April, 1880.)

Guan, any bird of the genus *Penelope*, with fourteen species, ranging from Texas to Paraguay. They are large handsome game birds, closely allied to the Curassow (q.v.), from which they chiefly differ in having under the throat a patch of naked skin that can be inflated at will. They feed on insects, fruit, and berries.

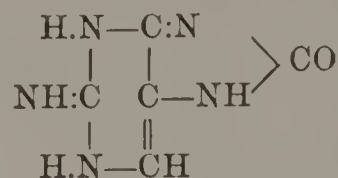
Guanaco (*Auehenia huanaco*), a South American ruminant, ranging in small herds over the Andes to Patagonia. It is the largest species of the genus, standing four feet at the shoulder, and is supposed to be the form from which the llama (q.v.) is descended.

Guanajuato, a province in the centre of Mexico, with an area of 12,500 square miles. It is mountainous in the north, but the south forms part of a fertile plain. It is very rich in minerals, gold, silver, copper, lead, and quicksilver being obtained. Some cattle are also reared, and woollen and cotton manufactures have been introduced by foreigners. The capital, of the same name, the centre of a large mining district, is a handsome town, and has among its public buildings the Alhondiga, or public granary.

Guanches. [CANARY ISLANDS.]

Guanidine, a compound of composition CN_3H_5 which may be obtained from *guanine* (q.v.) by the action of oxidising agents. It may also be prepared by numerous synthetic reactions which show its constitution to be represented by $\text{NH}:\text{C}(\text{NH}_2)_2$, so that it may be regarded as *urea* $\text{O}:\text{C}(\text{NH}_2)_2$ in which the oxygen is replaced by the group NH. It forms very soluble, deliquescent crystals, which act also as a strong base, combining readily with acids. A large number of compounds may be regarded as derived from guanidine, some of which are important physiologically; e.g. *creatine* (q.v.), *creatinine*, and many of great chemical interest.

Guanine, a substance which derives its name owing to its abundant occurrence in guano. From this source it may be obtained by boiling with milk of lime, boiling the residue with soda and then treating the solution with (1) sodium acetate, (2) hydrochloric acid. It is thus obtained as a white insoluble powder which forms crystalline compounds with both acids and bases. It has the composition $\text{C}_5\text{H}_5\text{N}_5\text{O}$, and its constitution appears to be that represented by the formula



It is found in the pancreas of some animals, and is of much interest and importance owing to its close relationship to *uric acid*, *xanthine*, *caffeine*, and other animal and vegetable products.

Guano, the droppings of fish-eating birds on rainless or nearly rainless sea-coasts. Besides penguins, cormorants, and other birds, seals contribute to the formation of true guano, and the name "bat-guano" has been used for the accumulated dung of these animals which occurs in many caverns in various quarters of the globe. Humboldt brought guano from the Chincha Islands of Peru to Europe in 1804, and when Liebig called attention to its value as a manure in 1840 it became an important article of trade; but the South American sources of the supply have been largely exhausted. It is also obtained from the Angra Pequena islands, off the south-west coast of Africa, and from the Kuria-Muria islands, off the coast of Muscat. The value of guano as manure depends upon its richness in phosphates and nitrogen, the latter occurring as urates and ammonium salts which would be dissolved out by rain. It also contains an alkaloid *guanine* ($\text{C}_5\text{H}_5\text{N}_5\text{O}$). The nitrogen, reckoned as "potential ammonia," varies from 1 to 25 per cent., the phosphate from 6 to 56, and moisture from 11 to 17 per cent. Guano is an actively stimulating manure, tending to cause a great production of foliage and therefore useful for grass crops; but, mixed with superphosphate of lime, it is also valuable for flowering plants and roots. It is sold by analysis, at about £13 per ton for the best qualities.

Guaques, a South American people of Colombia, whose territory comprises the district of Caqueta, state of Cauca, watered by the Caqueta, Caguan, Putumayo, and other affluents of the Amazons. This district is extremely productive, and the natives carry on a large barter trade with the surrounding civilised communities, exchanging wax, fish and other produce for hardware. The Guaques are still in a primitive state, fishers and hunters, living in wretched hovels of foliage, and wearing no clothes except the *fono*, a narrow loin-cloth worn only by the men. Amongst them also prevails the curious custom of the *courade* (q.v.), which is practised by so many wild tribes in both hemispheres. (*Los Indios del Andequi*. Popayan, 1855—English translation in *Bulletin of the American Ethnological Society*, New York, 1860-61.)

Guarana, or BRAZILIAN COCOA, is prepared from the seeds of *Paullinia sorbilis*, a native of northern and western Brazil, which, though much smaller, resemble those of the horse-chestnut, a member of the same natural order. They are ground into paste and dried into hard round balls. Guarana has a bitter astringent taste, and when grated into water and sweetened forms a favourite South American drink. It contains 5 per cent. of caffeine, or five times as much as coffee or maté, and more

than twice as much as tea; so that for medical purposes it may be regarded as impure caffeine. This alkaloid was previously to 1840 thought to be a distinct one, and was named *guaranine*.

Guarani, one of the great divisions of the American aborigines, who, with the closely allied Tupi of Brazil, occupy probably one-half of South America. According to some authorities, they form the substratum of the whole of the Brazilian populations, and their domain also comprises most of Paraguay, beside large tracts in Argentina, the Guianas, Venezuela, Bolivia, and Peru, with a total area of over 3,000,000 square miles, and a pure and mixed population of not less than 12,000,000. The Guarani language has even a still wider range, for it was adopted by the early missionaries as the base of the *lingoa geral* or "general language," that is to say, the general medium of intercourse throughout the greater part of the continent. But the Guarani proper, that is, those bearing this name, meaning "warrior," or "painted" (comp. the expression "war-paint"), are not numerous even in Brazil, where they are represented only by various small groups numbering altogether not more than a few thousand souls. In several districts they have been settled by the Brazilian Government in *aldeias* (villages or reserves), where they cultivate a little land and occupy themselves with various house industries. These are all classed as *mansos* ("tame" as opposed to the wild tribes), and are for the most part nominal Christians. During the early days of the Portuguese occupation, numerous alliances were formed between the white settlers and the Guarani, whose descendants, the vigorous and enterprising *Mamelucos*, have done more than all the whites together for the exploration, conquest, and settlement of the inland regions of Brazil. [MAMELUCOS.]

In Bolivia also, where the Guarani arrived towards the end of the sixteenth century, and where they occupy the spurs of the Andes in the provinces of Cochabamba and Tarija, their crossings with the Spaniards have produced a strong and handsome race whose language is generally, if not entirely, Spanish. Physically, the full-blood Guarani, those especially of Paraguay, where they still form the bulk of the population, and where their language is universally spoken, are characterised by short, stout figures, round face, low forehead, with slightly oblique eyes and a brownish-yellow complexion, giving them a distinctly Mongolic expression. Under the theocratic administration of the Jesuits in the famous Paraguay "missions" (1586-1767), their naturally peaceful and somewhat apathetic disposition degenerated into an abject spirit of obedience, of which the ruthless despot, Solano Lopez, took full advantage in the terrible war of the Triple Alliance (1862-70). The Guarani stock language presents some marked features that have been observed in few other native American tongues. It abounds in nasal gutturals and in monosyllables, which, like Chinese and the other members of the isolating family, change their meaning according to the tone with which they are uttered. (D'Orbigny, *L'Homme Americain*; Ruiz de Montoya, *Gramatica Guarani*.)

Guarantee, or SURETYSHIP, is an undertaking or promise to answer for the debt, default, or miscarriage of another person, and for which that other person remains liable. It is usually a simple contract, and the agreement or memorandum expressing or evidencing the transaction must, by the Statute of Frauds, be in writing, and must contain all the material terms, except that by a statute passed during the present reign ("The Mercantile Law Amendment Act, 1856") the consideration for the guarantee need not appear in writing. The guarantee may either be for one specified amount, or for any sum not exceeding that amount, or it may be a continuing guarantee limited or unlimited in amount. The surety under a guarantee has his remedy by action against the principal debtor, where such surety has been compelled to make a payment thereunder, and any one of several co-sureties who has paid more than his rateable proportion is entitled to claim contribution from the other or others of them. Persons holding offices or employments in the public service are frequently required to give security by means of sureties for the due performance of their duties. This subject is now regulated by "The Government Offices Security Act, 1875."

Guaraunos, the aborigines of the Orinoco delta and surrounding districts, reaching along the Guiana coast as far as the Essequibo river, and in Brazil to the Carupano district on the Paria coast. Both in speech and physical appearance they differ altogether from the neighbouring populations—having a rather broad face, low brow, large nose, abundant brown hair, scant beard, yellowish complexion. The account given of these natives by Humboldt on hearsay (*Relations*, vol. viii.) is greatly exaggerated. They do not live habitually on the tops of palm-trees, but in the districts subject to inundations raise their dwellings on platforms a little above high-water mark. They are skilled boatmen, and live more by fishing and hunting than by agriculture. (Level de Godas, *Official Report*, 1850; Michelena y Rojas, *Exploracion*, 1867.)

Guardian is one who has the care of the person or property of another confided to him. Guardians are appointed for the purpose of protecting the person, property, or rights of those who are supposed to be incapable of managing their own affairs—such as an infant or lunatic. They are of two kinds: (1) Guardians of the person or property, and (2) Guardians *ad litem* (i.e. to prosecute or defend an action). As to infants, an important alteration in favour of mothers has been effected by the "Guardianship of Infants Act, 1886," by which Act it is provided that the mother may, by deed or will, appoint a guardian after her own death and the death of the father of the children, to act jointly with the guardian (if any) appointed by the father. And the mother (if she survives the father) is constituted the guardian of her infant children generally, to act jointly with the guardian (if any) appointed by the father; but in such a case the court may associate one or more guardians with her. It is also now well settled

that the mother is the natural guardian of her illegitimate child. [POOR LAW, INFANTS, LUNATICS.]

Guards. The Guards are the choice troops of every army, and are generally more heavily armed than other soldiers. In the British army they form the garrison of London, and act as the sovereign's body-guard. They are termed the Household Brigade, and include both cavalry and infantry, the former consisting of the Life (Germ. *leib*, body) Guards and the Royal Horse Guards (about 1,200 men in all), and the latter of the Grenadier, Coldstream, and Scots Guards (5,000 men).

Guarini, GIOVANNI BATTISTA (1537-1612), a Ferrarese poet, was employed diplomatically by Alfonso II., of Ferrara, by Ferdinand de Medici, grand duke of Tuscany, and by the Duke of Urbino. His best work, *Il Pastor Fido*, written in imitation of Tasso's *Aminta*, enjoyed an immense popularity, and has been frequently translated. The author died at Venice.

Guatemala, the name of a Central American state and its chief town. 1. The *Republic of Guatemala* has Yucatan on the north, Mexico on the north-west, and Honduras and San Salvador on the south and south-east. It is bounded on the west by the Pacific, but has little coast on the opposite side, the state of Belize occupying half of the sea-line between Yucatan and Honduras. A large part of the country is yet unexplored, but the estimated area is 46,000 square miles, and the estimated population nearly one and a half millions. Guatemala was conquered in 1524 by a lieutenant of Cortez's, and remained under Spanish rule till the revolution in 1821. The present republic was founded in 1839 by Rafael Carrera, an Indian, who exercised dictatorial power till his death in 1865. From 1871 to 1885 General Barrios ruled, but after a period of firm government, during which Church property was applied to State uses and monastic orders suppressed, he fell in a war with San Salvador. In March, 1892, another General Barrios became President. Guatemala is extremely mountainous, and contains several active volcanoes of which Fuego, more than 12,000 feet high, is the chief. Earthquakes are frequent and severe. There are many rivers and lakes, but in some parts water is often scarce. The climate is healthy, except on the Pacific coast, where yellow fever not unfrequently prevails. The soil is very productive, maize, beans, sugar, cocoa, tobacco, india-rubber, sarsaparilla, and coffee being raised from it, as well as several fruits and vegetables, and some wheat and rice. There are several hundred species of gorgeously-plumaged birds, and tropical insects from the most beautiful butterfly to the noxious scorpion and tarantula abound. Iguanas and turtles are also found in large quantities. The mineral resources of the country, as yet but partially developed, include gold and silver, iron, lead, quicksilver, zinc, and many other metals. The chief article of export is coffee, next in importance to which come hides, indigo, and sugar. Weaving

and the making of pottery and saddles are the chief industries; but a fourth of the annual revenue is said to be obtained from the government monopoly of *aguardiente*, a spirituous liquor. Great Britain supplies nearly a third of the imports. In 1879 primary education was made compulsory and gratuitous, and there are some good schools in the capital, Belen, Quetzaltenango, and other towns. Guatemala is governed by a President, elected for six years by *plébiscite*, with a council of fifteen, six of which are his own nominees. The Assembly is elected by universal suffrage. The Public Debt is large, but the security is good. The chief towns of Guatemala besides the capital are Quetzaltenango, Chimaltenango, and the part of San José.

2. *Guatemala La Nueva*, the capital, is called "the new" to distinguish it from two other towns of the same name. It is situated on the S.W. of the Republic nearly 5,000 feet above the level of the sea, from which it is distant some 70 miles. It is well built and provided with all modern improvements, and contains numerous educational institutions supported by the state, as well as a cathedral, several hospitals, and two large markets. There is also a bull-ring and a subsidised theatre. Guatemala is a great centre for foreign trade. The inhabitants of Guatemala, most of whom are still nearly pure Indians, descendants of the five civilised peoples (Quichés, Cachiuels, Zutugils, Mams or Pokomans, and Pipiles) who at the time of the conquest occupied this region together with the present Mexican states of Chiapas and Soconusco, and the greater part of Central America as far as Chiriqui Bay. The Pipiles were comparatively recent intruders from the Mexican plateau, and many of them even still speak the Aztec language; but all the rest, as well as the less cultured Chols and Lacandones of the department of Vera Paz on the Mexican frontier, are members of the widespread Maya-Quiché family, whose domain included the whole of Yucatan and parts of Mexico as far north as the states of Vera Cruz and Tamaulipas. [MAYAS, QUICHÉS.] In Guatemala the Indians, although three or four times more numerous than the Creoles and half-castes, are still regarded as an inferior race scarcely entitled to the rights of citizenship. Very few are owners of the land they cultivate, and the great majority are held in a state of servitude almost worse than slavery to the planters and the money-lenders whose advances they are unable to redeem. Crossings between the whites, negroes, and aborigines have produced a great variety of types, showing every shade of transition from the European to the Indian and African. These half-breeds are all of Spanish speech, and are politically the dominant element. (Squier, *The States of Central America*; Adolf Bastian, *Die Culturländer des alten America*.)

Guatusos (PRANZOS), Indians of Central America, who occupy the basin of the Rio Frio in Costa Rica. Several geographical features of this region—plains, mountains, and rivers—are named from the Guatusos aborigines, who have hitherto kept almost entirely aloof from all contact with the whites, and have consequently preserved their

usages, language, and traditions more perfectly than perhaps any other native race. They allowed no strangers to penetrate into their territory, and the most extraordinary reports were long current regarding their appearance, customs, and origin, some supposing them to be descended from some English mutineers under Drake, who after the capture of Esparza took refuge in the Merivalles forests, killed all the men of the Pranzos tribe, and formed unions with the women. They were said to be much above the average height and to have red hair and blue eyes; but little was known of them beyond what had been gleaned by the few missionaries who have endeavoured to establish relations with this mysterious people. Lately, however, they have begun to visit the markets in the settled districts, even bringing offerings to the priests, "brothers of the sun." These show no trace of European blood, being of a dark brown complexion, with black hair and high cheek-bones, like the Chontals of Nicaragua, of whom they are probably a branch. So far from being fierce savages, as was formerly believed, they are peaceful agriculturists who have suffered much from the Ladinos invading their forests in search of rubber. (Franz in *Petermann's Mittheilungen*, 1862; Squier; Thiel; Reclus, vol. xvii.)

Guava, the fruit of *Psidium Guayava* and other species, small trees of tropical America belonging to the Myrtle family. The fruits vary very much in size, shape, and colour, the most valued being the "white guava" (var. *pyrifer*), with pear-shaped, yellow or whitish fruits the size of a hen's egg. The inferior "red guava" (var. *pomifera*), which is more apple-shaped, is also used in preparing *guava-jelly* and *guava-cheese*, which preserves, owing to the perishable character of the fruit, are the only forms in which the fruit is imported into England. The tree has been naturalised in the East, and thrives in English hothouses.

Guayanas, Indians of Paraguay, who occupy the rivers flowing to the right bank of the Parana, between lat. 25° and 26° S. They are a peaceful tribe, living partly by agriculture, partly by the chase. The Guayanas are members of the Guarani family, as is evident from their appearance and from the specimen of their language published by Lieut. D. Patiño, in the *Bulletin de la Soc. de Géographie*, August, 1868.

Guayaquil, the chief port of Ecuador, South America, stands on a peninsula at the head of the Bay of Guayaquil. The town, first founded in 1537, was not removed to its present site till a century and a half later. It is built chiefly of bamboo and is hot and unhealthy. Cocoa is the chief article of export, and straw hats and hammocks are made. There are also saw-mills and machine-works. A railway has now been extended many miles into the interior. The trade is almost entirely in foreign hands, about half being carried on by the British.

Guaycurus, South American Indians, whose territory lies mainly in that part of Gran Chaco, between the Paraguay and the Pilcomayo rivers, which, since 1876, has been included in the republic

of Paraguay. Tribes of this name are also met in the province of Matto Grosso, Brazil, and the people of Paraguay apply the term Guaycuru in a general way to all the Tobas and Lenguas, who constitute a large section of the wild tribes of Gran Chaco. All are probably branches of the Guarani family.

Guben, a town in Prussia on the river Neisse, 28 miles south of Frankfort-on-the-Oder. It suffered much during the religious wars of the 15th and 17th centuries. The making of hats and cloth goods are the chief industries.

Gubernatis, COUNT ANGELO DE, a versatile Italian writer, was born in 1840 at Turin. He studied under Bopp and Weber at Berlin, and was appointed professor of Sanskrit at the Institutio dei Studii Superiore, Florence, in 1863. In 1872 he published at London his *Zoological Mythology*, which was followed in 1878 by the *Mythologie des Plantes* (Paris). As a biographer he has written upon Manzoni, Giovanni Prati, and other Italian men of letters, and has given to the world the *Storia Universale della Letteratura* (1882-85), and a *Biographical Dictionary of Contemporary Writers* (1879-80, French ed. with suppl. 1891). He has also written successful plays, in which Rossi appeared, and founded five journals. In 1878 he lectured on Manzoni at Oxford. He married a daughter of Bakunin.

Gudgeon (*Gobio*), a European genus of small carp-like fishes, from clear rivers with gravelly bottom. The scales are of moderate size; the spineless dorsal is short. There is a barbel at the angle of the mouth, and the pharyngeal teeth are in two rows. *G. fluriatilis*, the common Gudgeon, about 8 inches long, olive-brown, spotted with black above, white below, is British. The only other species, *G. uranoscopus*, is found in the Danube and Dnieper, and their affluents, Ladislavia and Pseudogobio from Eastern Asia, are closely allied.

Gudrun, an old German epic poem, dating probably from the 12th century, was translated into modern High German by Simrock. Its authorship is unknown. Gudrun, from which the poem takes its title, is the daughter of Hettel, King of the Frisians. She is carried off by Hochmut, son of the Norman duke, in whose country she undergoes great sufferings, but refuses to break her troth to Herwig of Zealand, who ultimately comes and rescues her.

Guelderland, or GELDERLAND, a Dutch province, having Germany in the S. and E., Overijssel in the N., and the Zuyder Zee on the W. It is in area 1,957 square miles. It is not so flat as some parts of Holland, and is indeed in many places quite picturesque. It enjoys a healthy climate and possesses a fertile soil from which wheat, rye, and tobacco are largely raised. The chief rivers are the Rhine, on which stands Arnheim, the capital, the Yssel, on which are Deventer and Kampen, the Waal, and the Maas, which forms the southern boundary. The present province was formed out of the old duchy of Gueldres, which for several centuries enjoyed practical independence, which lasted even after it had become Hapsburg property in 1483.

In 1543, however, it became part of the Austrian Netherlands. In the War of Independence its sympathies were divided, the northern part alone taking part with the insurgents. In 1814 the old duchy was divided between Prussia and Holland.

Guelder-rose, the garden name of the cultivated variety of *Viburnum Opulus*, a tree belonging to the Honeysuckle family, in which all the flowers in the cymose clusters are neater and have the corolla much enlarged in lieu of the absent essential organs. In this variety, introduced into cultivation from Guelderland, these corollas, each three-quarters of an inch across, are massed into a globose inflorescence, whence the tree is popularly known as the Snow-ball Tree. The wild form of the species, in which only the outer flowers are neuter and have enlarged corollas and the inflorescence is flat, is known as Water Elder, flourishing by the water-side. Its opposite leaves are irregularly three to five-lobed and turn red in autumn, and its fruits are elliptical translucent blood-red berries; so that, unfortunately, both in summer and autumn branches are torn off for sale in the streets of London. The cultivated tree flourishes in the clayey soil of gardens near London. The name Mealy Guelder-rose is a book name for *V. Lantana*, a shrub common on calcareous soils and also known as Wayfaring Tree. Another allied species is the Laurustinus of our shrubberies (*V. Tinus*).

Guelfs and Ghibelins, the names given to the two contending parties which divided both Italy and Germany in the Middle Ages. They became party designations in consequence of their use as war-cries at the battle of Weinsberg in Suabia (1140) between Henry the Lion, Duke of Saxony, and Conrad of Hohenstaufen, Duke of Franconia, afterwards the first of the Suabian Emperors. Welf was the name both of the founder of the house and of Henry the Lion's brother, while Waibling was a village in the territory of the Hohenstaufen, in which Conrad's brother, Frederick, had been brought up. The forms Guelfi and Ghibellini were due to the Italian mode of pronunciation. As a general rule, the Guelfs supported the authority of the Popes, the Ghibelins that of the Emperors; but amid the confusion of political strife these principles were sometimes lost sight of, and the struggle became merely one of personal ambition. The Guelf party included many of the free cities of Northern Italy, which sought protection against the encroachments of the Emperors, but the leading cities were regarded with much jealousy by the others, and there was often a standing feud between two neighbouring cities, so that for each Guelf community there was generally one or more on the side of the Ghibelins. Of the great families those in the north generally adhered to the Ghibelins, those of Central and Southern Italy to the Guelfs. Many of the cities, as well as the nobles, constantly changed sides, according to the exigencies of the moment. The feud practically came to an end in the fourteenth century. The present royal family of Great Britain are descended from the house of Welf, through Ernest Augustus, Duke of Hanover (son of

George, Duke of Brunswick-Lüneburg), who married Sophia, daughter of James I. [DANTE.]

Guercino, "the Squint-eyed," is the name by which GIAN FRANCESCO BARBIERI, a Bolognese painter, is commonly known. He was born at Cento about 1590, and died at Bologna in 1666. He painted in several styles, but the dominant influence with him was that of Caravaggio. After visiting Rome and Venice, he finally settled down to a prosperous career at Bologna in 1742. Among his finest works are *St. Petronilla* (Capitoline Gallery), and the *Death of Dido* (Spada Palace), at Rome, and *Angels Weeping over the Dead Body of Christ*, in the National Gallery, London.

Guericke, OTTO VON (1602-86), a Prussian natural philosopher, was born at Magdeburg, and died at Hamburg. He invented the air-pump in 1650, and experimented with it before the Imperial Diet at Ratisbon four years later. He also made some discoveries in electricity. During his life he visited Holland, France, and England.

Guerillas, properly troops of predatory skirmishers, but now always used of the single members of such a troop. The Spanish *guerrilleros* were bands of peasants and shepherds who embarrassed the French armies in the war of 1808-14 and afterwards played a prominent part in the Carlist and other civil wars.

Guérin, GEORGES MAURICE DE (1810-39), a French poet of great promise, was born at La Cayla, Languedoc, of noble family. He was educated for the Church at Toulouse and Paris, and in 1832 joined the monastic society of Lamennais at La Chenâie in Brittany. After Lamennais left, Guérin went to Paris, where he taught at the Collège Stanislas, and contributed to the journals. In 1838 he married a Creole lady, but died of consumption in the following year in his native province. He left two poems, *Le Centaure* and *La Bacehante*, which in 1862 were published with his letters and journals. He attracted the attention of Georges Sand and Sainte-Beuve, and there is a well-known essay by Matthew Arnold on Maurice and Eugénie de Guérin. The latter devoted her life to her brother, whom she survived nine years only.

Guernsey, one of the Channel Islands, about 28 miles from the French coast and 65 from Start Point, has an area of 28 square miles. The climate is excellent, and large quantities of fruit and vegetables are exported, as also grey and some red granite. Port St. Pierre, the chief town, has a good harbour, a school founded by Queen Elizabeth with scholarships to Jesus, Exeter, and Pembroke Colleges, Oxford, a thirteenth-century church, a ladies' college, and a good market. Guernsey is the residence of a Lieutenant-Governor, and has a somewhat oligarchical constitution. The land is mostly held by "peasant proprietors," and the old Norman law prevails.

Guerrazzi, FRANCESCO DOMENICO (1804-73), Tuscan patriotic writer, was born at Leghorn. When the Grand Duke fled from Tuscany in 1849,

he, then a Minister, became a member of the provisional government, of which he held the almost absolute direction until the return of the prince. He was now imprisoned for three years on a charge of conniving at the revolution, although he had done his best to preserve the continuity of government, and was afterwards to be sent to the galleys for life. The sentence was changed to one of banishment, but after a few years Guerrazzi returned from Corsica and sat in the parliament at Turin. Chief among his works were his *Apologia* (1857), and the historical novels *La Battaglia di Benevento* (1827) and *L'Assedio di Firenze* (1836).

Guesclin, BERTRAND DU, a great French general, was born in Brittany about 1320. He distinguished himself in the Brittany Succession War as a partisan of Charles de Blois, and during the Hundred Years' War was the only French leader who equalled the great English captains. He gained some successes while King John was a prisoner in England, and before the accession of Charles V. had driven the enemy from the heart of the kingdom. In 1364 he defeated Charles the Bad of Navarre at Cocherel, but in the autumn of the same year was himself defeated and captured by Sir John Chandos at Auray. After his ransom he led the army of Henry of Trastamare against the Black Prince, who supported Pedro the Cruel. The result of the battle of Najera, or Navarette, was that Du Guesclin was again a prisoner (1367). Having been ransomed, he nevertheless again met Don Pedro, and this time defeated him at Montiel and gave the crown to his brother and foe. Soon after this he was made Constable of France, and brought his career to a glorious end by gaining back almost the whole of his country from the English.

Gueshtûlas, a group of nine confederate Berber tribes chiefly in the Great Kabyle uplands, Algeria, with a collective population of nearly 20,000. By some writers the term *Gueshtûla* has been identified with the *Getuli* of antiquity. The *Getuli* occupied a vast domain in Mauritania, mainly south of Numidia; but they were broken and dispersed in various directions by the great Arab invasion of the eleventh century, and some of their tribes may still be represented by the Bu-Addu, Bu-Gherdân, Kufi, Shurfa, and the other members of the *Gueshtûla* confederacy in Algeria.

Guest, EDWIN (1800-80), a Cambridge antiquary, was eleventh wrangler in 1824, and afterwards successively fellow and master of Caius College. In 1841 he was elected F.R.S. He was author of a *History of English Rhythms* (1838), *Origines Celticae*, and similar works, which were valuable in their day, which, however, was before the scientific treatment of historical subjects had become usual.

Guetarnia, a Berber people of the province of Oran, Algeria. There are two divisions, Guetarnia Fuaga and Tahhta ("Upper" and "Lower" Guetarnia), the former in the uplands between the Sig and Habra rivers, the latter on both banks of the Sig above Saint Denis.

Gueux ("BEGGARS"), the name adopted by the league of nobles formed in 1565 to resist the introduction of the Inquisition into the Netherlands by Philip II. of Spain. The name was originally applied to them in contempt. Their efforts were unsuccessful; but the naval war instituted by a branch of the confederacy who called themselves the "Beggars of the Sea" ultimately resulted in the independence of the Netherlands (1648).

Guevei (*Cephalolephus pygmæa*), a small South African antelope, not much bigger than a rabbit.

Guglielmi, PIETRO (1727-1804), an Italian composer, was born at Massa di Carrara. After giving successful performances in the chief cities of Italy, he visited Dresden and other places in Germany, and remained five years in London. In 1777 he came to Naples, and in 1793 was made maestro di cappella by Pope Pius VI. Among his operas were *La Didone*, *La Serra Inamorata*, and *La Bella Pescatrice*.

Guiana, a region in the N. of South America, lying between Venezuela and Brazil, two provinces of which are also known by this name. What is ordinarily known by the name is the threefold tract of country, consisting of British Guiana, Dutch Guiana, and French Guiana. This country is well watered by numerous rivers, which are, however, only to a slight degree navigable, having numerous cataracts in their courses, mud-banks at their mouths, and sand-banks in their channels. The climate is hot and moist, and the rainfall heavy, especially in southern, or French Guiana. Vegetation is luxuriant, and a large quantity of timber is obtained. Gums, bark, nuts, balsams, cotton, tobacco, caoutchouc, and many plants useful for medicinal purposes are found in abundance, and of edibles, arrowroot, tomatoes, guava, cassavas, rice, yams, and many different fruits are indigenous. Besides ferns and tree-ferns, there are orchids growing along the tops of the trees, and the Victoria regia lily. The Spaniards first came to Guiana in the first years of the 16th century, and in this and the succeeding centuries several expeditions in search of gold and the fabled El Dorado landed in the country, notably the disastrous one of Sir Walter Raleigh. The Dutch were the first to really effect a settlement on the Essequibo in 1613; the English came to Surinam in 1650; and lastly the French arrived. The British tried to seize the whole country, but in 1667 gave up Surinam to the Dutch in exchange for what is now New York. A few years later the French came to Cayenne, farther south, where they have remained ever since. At the peace of 1814 Surinam, which had been captured in the war, was again given back to the Dutch, but all the other conquests, comprising the north of Guiana, were retained by Great Britain.

British Guiana, or Demerara, has Venezuela and Brazil on the W. and S., Dutch Guiana on the E., and the Atlantic on the N. The exact line of the Venezuelan boundary is disputed, but the area of the country according to the British estimate is 76,000 square miles, with 320 miles of coast. In

the W. there are several chains of mountains, that of Roraima reaching from 8,000 to 9,000 feet. The chief rivers are the Berbice, the Demerara, and the Essequibo, which names are also given to the three counties into which British Guiana is divided. The chief towns are Georgetown, the capital, and New Amsterdam. Sugar is much grown and largely exported, and the chief other industries being wood-cutting and gold-mining. Chinese and coolies are chiefly employed in the plantations. The administration is in the hands of a governor, assisted by a Court of Policy of 15 members, 8 of which are elected by the people. Taxation is levied by a court consisting of the Court of Policy and 6 members elected by popular vote. The Executive Council consists of the governor, 4 official and 2 unofficial members nominated by the Crown.

Dutch Guiana, or Surinam, has an area of 46,085 square miles and a coast-line of 240. It is separated from Brazil on the S. by the Tumuc-Humuc Mountains, and from French Guiana, on the W., by the river Maroni. Very little of the country is cultivated, the greater part of it being still primæval forest. Sugar and cocoa are, however, grown and exported, and gold-mining has increased of late years. In 1887 new mines were discovered between the Tapanari and Arva rivers, a district claimed both by the Dutch and the French. The capital is Paramaribo. The legislative body is elected by the people, and the executive consists of a governor and council.

French Guiana, or Cayenne, lying between Dutch Guiana and Brazil, has an area of about 31,000 square miles. There is a coast-line of about 240 miles. The chief rivers are the Maroni, the Sinnamary and the Oyapok, on the Brazil boundary. There are a few ranges of low hills. Very little commerce is carried on, but some gold is obtained from the mines and exported, some also being smuggled. The climate is extremely unhealthy, malarial fever and dysentery being prevalent. During the French Revolution some of the Terrorists, including Billaud-Varennes and Collot d'Herbois were despatched to Guiana, and later on some who deserved a better fate. From 1853 to 1864 an unsuccessful attempt was made to form French Guiana into a penal colony. Slavery was not abolished here till 1848. To the N.W. of Cayenne are the Îles de Salut, between which and the town there is a good roadstead.

Guicciardini, FRANCESCO (1482-1540), an Italian writer and statesman, was a native of Florence, where he was in early life a professor of law. He won his reputation as a diplomatist by his mission to Bruges in 1512, and in 1518 was named governor of Modena and Reggio. In 1521 he drove the French from Parma, and was subsequently governor of that state, the Romagna, and Bologna. In 1534 he left the Papal service, and began to take part in the affairs of Florence, where he took a leading part in the restoration of the Medici and was a member of the Commission of Twelve. From 1534 till his death he withdrew from public business and devoted himself to the composition of his *Storia d'Italia*, which described

the course of affairs between 1494 and 1532 in a critical spirit, but in a prolix style. His *Maxims* have been more popular.

Guide Bars, in a steam-engine, gas-engine, or other similar motor, are parallel bars along which the cross-head of the piston-rod may slide. The rectilinear motion of the piston-rod is to be converted into a rotatory motion of the shaft by means of the connecting rod. One end of this must travel in a straight line, the other end in a circle. The guide-bars provide the constraint in the first case, the crank the constraint in the second.

Guido Aretino, of Arezzo, a Benedictine monk, who is credited with the invention of counterpoint, flourished in the 11th century. Experts consider it certain that he designed the construction of the stave, and probable that to him is due the discovery of the hexachord, solmisation, and the Harmonic Hand. Guido, who was invited to Rome by two Popes, left works entitled *Micrologus* and *Antiphonarium* on musical theory.

Guido Reni, who is usually known as GUIDO (1575-1642), the great Bolognese painter, was born at Calvenzano, near Bologna, his father being a music master. He was placed in the studio of the Caracci, and took lessons in fresco-painting from Ferrantini. In his early period, to which belong *The Massacre of the Innocents* and the *Pietà* in the Bologna Gallery he was under the influence of Caravaggio. In 1596 he went to Rome, and studied the work of Raffaele. He remained under the spell of that master in his second period, to which belong his *Aurora Preceding the Chariot of the Sun* (in the Palazzo Rospigliosi at Rome) and his unfinished *Nativity* in San Martino, at Naples. During his third period he modelled himself in the art of classic antiquity and attained great delicacy, but lost warmth. Among Guido's pupils were many of the best Bolognese painters, among whom was "Il Pesarese" (Contarini), whose portrait of his master is at Bologna. The Louvre, the Dresden Gallery, and the Museo at Madrid are especially rich in Guidos. There is one at Hampton Court, and the National Gallery has a *Coronation of the Virgin* in his early manner, three in his second and best, and two in his last.

Guienne, an ancient province in S.W. France, now divided into the departments of Gironde, Dordogne, Lot, and Aveyron, with parts of Lot-et-Garonne and Tarn-et-Garonne. It was at one time closely connected with English history, being brought by Eleanor as part of her dowry on her marriage with Henry II.

Guignet's Green is a green powder obtained by strongly heating a mixture of boric acid with potassium bichromate, and treating the resulting mass with water. It has the composition $\text{Cr}_2\text{O}_5\text{H}_4$ ($\text{Cr}_2\text{O}_3 \cdot 2\text{OH}_2$), and is very largely employed as a pigment.

Guilds, or, more properly, *Gilds*, were associations formed for various purposes during the Middle Ages. They have been variously derived from the Roman *collegia opificum* (colleges of artisans) and

the assemblies of the Teutonic tribes and families at their great sacrificial feasts, but the true view seems to be that they grew naturally out of the circumstances of the time, associations of a more or less voluntary character taking the place of the organisations of the tribe and family as the basis of social life. The Anglo-Saxon word *gild* has various meanings, including "tax" or "payment," "sacrifice," and "worship." Perhaps the associations were called gilds because they were maintained by the joint contributions of the members. During the Anglo-Saxon period we read of *frith gilds*—associations for mutual protection at a time when there was no efficient central authority—and *religious gilds*, which concerned themselves with the spiritual welfare of their members both in this world and in the next. At this stage, however, and to some extent at a later period, the secular gilds also were, more or less, religious societies, and throughout their whole history the convivial element, which displays itself in constantly-recurring banquets, is a very striking feature. Soon after the Conquest we hear for the first time of the *gilds merchant*. They are intimately connected with the royal charters which conferred on the privileged towns the right of managing their own affairs, subject to a fixed annual payment. Speaking generally, the gild merchant may be described as the corporate body of citizens, in so far as the activity of the latter was confined to matters of industry and trade. The two bodies, however, were not necessarily identical; a member of the gild was not always a burgher, nor a burgher a member of the gild. Although the gilds were very jealous of their privileges, and endeavoured to keep the trade of the town in their own hands, they often found it to their advantage to admit neighbouring lords and their tenants, and even traders living at a considerable distance. Moreover, many charters contain no mention of a gild, which shows that it was not regarded as an essential element in the town constitution. Economic progress resulted in the division of industry; the man who had hitherto been at once weaver, fuller, and dyer, now followed only one of these trades. This change led to the formation of the *craft gilds*, for it was often found convenient to allow those engaged in some one branch to regulate the methods of production and other matters connected with the craft. Many of the functions of the gild merchant were thus gradually absorbed by the craft gilds. On the Continent these gilds became very powerful, and their dissensions with the constituted authorities gave rise to much social disturbance; but in England this was impossible, owing to the restraining influence of the royal authority. The English craft gilds possessed no independent jurisdiction; many matters closely connected with industry, such as the regulation of wages and prices, were regarded as outside their province, and in their ordinances they were obliged to follow the lines laid down in the enactments of the civic authorities and the statutes of the realm. Within these limits the gilds supplied an efficient machinery for carrying out the policy which seemed conducive to the welfare of society at large. The aim of industrial

legislation at this period was not to promote the increase of wealth, but to ensure the security and well-being of every member of the community, regarded as a separate individual. Like all mediæval associations, the whole gild was responsible for the conduct of each of its members. It might, therefore, be entrusted with what was the chief object of care, the protection of the ignorant and unwary consumer. The gild-wardens visited the workshops to see that goods were honestly and skilfully made, and when finished they were to be sold in the open market, where there was no opportunity for over-reaching or fraud. Besides master-workmen, the gilds included apprentices and journeymen. Rules concerning apprenticeship are numerous in the gild-statutes, but they do not appear to have any specially economic significance. A period of probation was always necessary before joining an association, and this would apply to the gilds as well as the other bodies, since they were responsible both for the efficiency and the good behaviour of the craftsmen. The enforcement of a term of apprenticeship and the restriction of the number of apprentices allowed were certainly not intended to raise the profits of the gild by limiting the number of workmen. The gilds did make some attempts to legislate in their own interests, but they were speedily checked by the royal justices. The mutual relations of the gild-brethren, although of secondary importance, must not be entirely overlooked. Allusion has already been made to their convivial gatherings, but they showed their fellow-feeling to better purpose by maintaining their own sick and poor. There was no necessity for a poor-law in the Middle Ages. The expansion of English commerce during the latter part of the fifteenth century rendered the gild system an inadequate method of industrial organisation. At the same time, the gilds—which had now in many cases acquired a share in town government—tended to become narrow and exclusive bodies, under the management of the richer members. The result was that industry drifted away from the towns to new centres in the country, where it was conducted on different principles. The confiscation of the gild lands by Henry VIII. and Somerset hastened on their decline. The London gilds still survive in the City Livery Companies, but they have entirely lost their original characteristics.

Guildford, the capital of Surrey, is a parliamentary and municipal borough 31 miles S.W. of London by rail. It is picturesquely situated on a slope of the chalk downs, beneath which runs the Wey, the High Street terminating in an old bridge with five arches. Of the ancient Norman castle little now remains excepting the lofty and massive square keep. The castle precincts are tastefully laid out as a public recreation ground. The High Street is lined by some fine old buildings, including the Guildhall (1687), King Edward VI.'s Grammar School, and Trinity Hospital, founded in 1619 by Archbishop Abbot for twenty aged persons, in the chapel of which there is some good stained glass. Near the High Street is the interesting Norman church of St. Mary, which has two

apsidal terminations. There is a trade with London in grain, timber, and malt.

Guillemot, any bird of the genus *Uria*, of the Auk family (*Alcidae*), with eight species, representing in arctic and temperate regions the Penguins of the antarctic seas. The sharp bill is of moderate length, the wings and tail are short, the legs are placed so far back that the birds on land assume a nearly erect position, and their walk is ungainly; the hinder toe is absent, and the three toes in front are connected by a membrane. They swim and dive with great facility, using the half-opened wings as paddles in the latter process, but the flight is heavy. They feed on crustaceans and fish-fry, and are eminently social, breeding together in large companies. The single pegtop-like egg is deposited on the bare cliff, and the male shares in the duties of incubation and the care of the young. The Common, or Foolish, Guillemot (*U. troile*), about eighteen inches long, is abundant all round our coast. The plumage is dark brown above, the lower part of the neck in front and all the under surface is white in summer, and in winter the white spreads to the head. The eggs taken at Lundy are sent to Bristol for clarifying wine, and many of those taken on the Yorkshire coast are used in Leeds in the preparation of patent leather. *U. bruennichi*, doubtfully British, has a stouter bill and the secondaries tipped with white, so as to form a bar across the wings. *U. grylle*, the Black Guillemot, is smaller than the common species, has the summer plumage deep black glossed with green and a white patch on the wings.

Guillotine. (1) An instrument used in France for decapitating condemned persons. It was introduced by the Convention in 1792, and many thousands perished by this means during the first Revolution. It is named after Dr. J. I. Guillotin, who in 1789 had proposed the adoption of some more merciful method of execution; but the actual inventor is said to have been a Dr. Louis, from whom the instrument was at first termed a *louisette*. (2) In metallurgy, a large iron weight which, by being allowed to fall from a height, is employed for breaking up iron plates.

Guinea, a gold coin current in England from 1663 to 1813. After several changes, the value was finally fixed at twenty-one shillings. It was so called because it was originally coined from gold which came from Guinea in Africa.

Guinea, a portion of the west coast of Africa, the limits of which have never been precisely determined. Approximately, it may be said to extend from Cape Verga in lat. 10° 30' N. to Cape Negro in lat. 16° S. It is divided into Upper and Lower Guinea, on the northern and eastern sides of the Gulf of Guinea respectively. The former includes Sierra Leone, Liberia, the Ivory Coast, the Gold Coast, the Slave Coast, and the Cameroons, the latter the Gaboon Colony, the Congo Free State, Angola, and Benguela. In the neighbourhood of the coast the climate is extremely unhealthy, owing to the shallow lagoons which are separated from the sea by narrow ridges of sand. Farther

inland the surface rises through a series of gradually ascending plateaux to the level of the African table-land.

Guinea, GULF OF, a large bay on the west coast of Africa, lying between Cape Palmas on the N.W. and Cape Lopez on the S.E.

Guinea-corn. [DURRA.]

Guinea Fowl, any bird of the African genus *Numida* of the Pheasant family, with nine species ranging over the continent and eastward to Madagascar. There is a warty membrane at the base of the short stout bill, the lower mandible is wattled, and the head bears a horny casque (as in the domesticated species) or a feathered crest. The plumage is bluish-grey, thickly spotted with white, which is generally the colour of the outer quills. *N. meleagris*, the Common Guinea Fowl, is well known as a domesticated bird. It is about the size of a hen, and its flesh and eggs are in high esteem. The cry is harsh, and somewhat resembles the words "Come back!" uttered sharply. Guinea fowl are naturally monogamous, but they are said to do best in domestication when one cock is kept to two or three hens.

Guinea Green, a dark green dye, which appears of the same colour by artificial light. It has a very complicated formula, being the sodium disulphonate of diethyl-dibenzyl-diamido-triphenyl-carbinol, and is closely related to *rosaniline*, *malachite green*, and very many other dyestuffs.

Guinea-pig, a popular name for any species of the Rodent genus *Cavia*, involving an error in each word, for they are natives of South America, not of Africa, and are in no way related to the swine. They are timid rabbit-like animals, with short limbs bearing four toes on the front and three on the hinder pair; the ears are short, the lip is not cleft, and the tail is rudimentary or wanting. The Restless Cavy (*C. aperca*), from which the domesticated form (*C. cobaya*) is probably derived, and from which the latter differs little except in its varied colouring, lives in small companies on the banks of the La Plata, ranging northwards as far as Brazil. The great plains of South America are the home of allied species. Other forms are the Bolivian Cavy (*C. boliviensis*), the Rock Cavy (*C. rupestris*) from Brazil, and the Southern Cavy (*S. australis*) ranging to Magellan Straits.

Guinea-worm (*Filaria medinensis*), belongs to the order *Nematoda* or Threadworms. The adult form lives beneath the skin of man and, more rarely, of the horse; it occurs in the tropical parts of Africa and Asia, occasionally also in the West Indies. A length of six feet is sometimes reached. Very numerous living young are produced, escape from their host and, for a time, swim freely in fresh water; they then bore their way into the body of a small crustacean, Cyclops, where they undergo further development, but the sexually mature condition is only attained when the Cyclops is swallowed by a man or a horse, through whose tissues the young worms make their way to a position beneath the skin, usually of the feet or legs.

Guinness, SIR BENJAMIN LEE, BART. (1798–1868), belonged to the well-known Dublin brewing firm established in 1759. In 1865 he defrayed the entire cost of restoring St. Patrick's Cathedral. He was created a baronet in 1867. His eldest son ARTHUR EDWARD (b. 1840) was raised to the peerage as Baron Ardilaun in 1880. His third son EDWARD CECIL (b. 1847), who has expended large sums in erecting sanitary workmen's dwellings in London and Dublin, became Baron Iveagh in 1891.

Guiscard, ROBERT (1015–85), was the sixth son of Tancred, Lord of Hauteville, in Lower Normandy. Enterprise and the love of adventure led him to join his elder brothers William, Drogo, and Humphrey, in South Italy. By his daring courage he greatly contributed to the Norman victory at Civitella (1053). In 1054 he became President and first count of the aristocratic republic of Apulia, an office which had been held by his three brothers successively. In 1060 Pope Nicholas II. granted him the title of duke. The territory over which he ruled was conterminous with the subsequent kingdom of Naples, including the Greek provinces of Calabria and Apulia, the Lombard principality of Salerno, the republic of Amalfi, and the inland dependencies of Beneventum. In the course of the same year he entrusted his younger brother Roger with the conquest of Sicily, a task which it took thirty years to accomplish. In 1081 he and his son Bohemund began a series of invasions of the Eastern Empire, terminated only by his death in the island of Cephalonia.

Guise, the name of a celebrated family of French dukes, who took their title from the town of Guise (q.v.). CLAUDE DE LORRAINE (1496–1550), the first duke, was the fifth son of René II., Duke of Lorraine. He served in Italy under Francis I., distinguishing himself at the battle of Marignano (1515). The title was bestowed upon him for his services in suppressing a revolt in Lorraine. He married Antoinette of Bourbon, and was the father of Mary of Guise, wife of James V. of Scotland and mother of Mary, Queen of Scots. His son, FRANÇOIS DE LORRAINE (1519–63), second duke, was one of the greatest generals of his time. His chief military exploit was the successful defence of Metz against Charles V. (1553). He afterwards became the leader of the Catholic party and conducted the war against the Huguenots, whom he defeated at Dreux (1562) and elsewhere. He was assassinated. His memoirs are extant. CHARLES, CARDINAL DE LORRAINE (1525–74), brother of the preceding, was one of the most bitter opponents of the Huguenots. He was employed in a diplomatic capacity by Francis II. and Charles IX. HENRI I. DE LORRAINE (1550–88), third duke, son of François, distinguished himself while still a boy in the war against the Turks in Hungary. He afterwards carried on the struggle against the Huguenots, whom he encountered at Jarnac and Moncontour (1569). He was one of the chief promoters of the massacre of St. Bartholomew (1572), and founded the "Holy League," nominally in defence of Church and State, but really for the purpose of raising himself to the throne. Emboldened

by his successes against Henri of Navarre, he entered Paris on the "day of the barricades," in defiance of the prohibition of Henri III., who was forced to withdraw to Blois. Thither the duke was summoned and an outward reconciliation was effected, but he was immediately afterwards assassinated by the king's command, together with his brother and fellow-conspirator LOUIS, CARDINAL DE LORRAINE (1555–88). HENRI II. DE LORRAINE (1614–64), fifth duke, took part in the Neapolitan insurrection of 1647, but fell into the hands of the Spaniards (1648). In 1652 he was released, and returned to Paris. He subsequently became grand chamberlain.

Guise, a fortified town in the French department of Aisne, on the Oise, 25 miles E.N.E. of St. Quentin. The castle of the Dukes of Guise, now in ruins, is situated on a height above the town. Cotton and woollen goods are manufactured, and there are oil-works, tanneries, and iron-works established by M. Godin and conducted on the co-operative principle.

Guitar, a musical instrument resembling the lute, with six strings, three of which are of catgut and the remainder of silk interwoven with silver wire. It is played by striking the strings with the fingers of the right hand, the left hand being employed to make the notes of the music on the finger-board.

Guizot, FRANÇOIS PIERRE GUILLAUME (1787–1874), statesman and historian, was born at Nîmes of a Huguenot family. After his father's execution (1794) he was brought up at Geneva by his mother. In 1805 he went to study law at Paris, but devoted himself chiefly to literature, and in 1812 was chosen professor of modern history at the Sorbonne. Under the Restoration Government of 1814 he was Secretary-General of the Ministry of the Interior, whence he removed to the Ministry of Justice after the Hundred Days. In 1821 he was driven from office owing to his opposition to the reactionary policy of the Bourbons. During his exclusion from a life of public activity, which lasted until 1828, he put himself forward as the representative of the *Doctrinaires*, a political school whose ideal was the English constitution, and pursued his historical studies, publishing the *Mémoires* relating to English and French history, the first part of the *History of the English Revolution*, and the lectures on the *History of Civilisation*.

After the Revolution of July, 1830, he was at first Minister of the Interior, and subsequently, as Minister of Public Instruction (1832–1836), organised a system of primary education. In 1840 he resided in England for a short time as ambassador, but was recalled by Louis Philippe to take the post of Foreign Minister in a cabinet which was virtually placed under his direction. In 1847 he became Prime Minister in name as well as in fact. His foreign policy was at first very successful. The friendly relations with England, which had been threatened by the warlike policy of Thiers, were maintained until Palmerston's return to office as Foreign Secretary in 1846; but his conduct in regard to the "Spanish Marriage" brought the French Government into discredit, and compelled

Guizot to rely on the support of Austria and other reactionary courts. At the same time he adopted a reactionary policy at home, governing by means of oppression and corruption, and refusing to concede parliamentary reform. He was finally driven from power by the Revolution of 1848, and devoted the remainder of his life to literary and historical studies. After a period of exile in London, he returned to France, and settled at Val Richer, near Lisieux. Guizot was a man of considerable ability and force of character, but he was too narrow-minded to be able to cope with the political difficulties of the time. As an historian he did much to develop critical and scientific methods. Among his chief historical works, besides those already mentioned, were his *History of Representative Government*, and his *Life, Correspondence, and Writings of Washington*.

Gujarâti (GUJRÂTI), one of the chief Gaurian (Neo-Sanskritic) languages, current throughout Gujarât, West India. It flows directly from the Sauraseni Prakrit, and retains a large number of the old Sanskrit inflections, and has also borrowed numerous Arabic and Persian elements. Gujarâti, which is written with a modified form of the Devanâgarî characters, is the language of the Parsees of Bombay. It has undergone little change since the fifteenth century, when its forms were fixed by Narsingh Mehta, the first noted Gujarâti author.

Gujars, a widespread nomad Aryanised people of Northern India scattered over the North-Western Provinces and parts of Kashmîr. Tall, gaunt figures, forehead and lower part of the face narrow, nose curved, light eyes, scant beard. Those of the Budil district, Kashmîr, seem to have a peculiar idiom of Non-Aryan type, but all the rest speak the languages of their more permanent winter homes. "Thus there are Gujars in Kashmîr who speak Kashmîri, while those who came to the middle mountains speak a mixed dialect of Panjâbi, or Dogri and Pahari" (F. Drew, *Jammoo and Kashmîr*, p. 110). The Gujars are probably of Jât stock; those of Peshâwar, who are Mohammedans, form "khels" or tribal groups like their neighbouring Afghâns.

Gujerât, a province of N.W. India, consisting chiefly of the Baroda dominion and the native states on the peninsula of Kathiawar. It includes the districts of Ahmedabad, Kariah, Broach, and Surat, which form part of the Bombay Presidency.

Gujramvala, a district and town in the Punjab, 40 miles north of Lahore. It was the birth-place of Runjeet Singh.

Gules is the heraldic name for the colour red when employed in armoury. The derivation of the word is obscure, several possible origins having been suggested. When engraved, perpendicular lines at right angles to the top of the escutcheon are used to represent it.

Gulf Stream. The Gulf Stream is so-called from the Gulf of Mexico, whence it flows in a north-easterly direction, skirting the coast of North America. It has at first a minimum breadth of 50

miles, and a maximum speed of 5 miles an hour. As it advances its speed lessens, and it gradually becomes broader. The depth varies inversely with the breadth; between Bermuda and New York the former is 100 fathoms, the latter 80 miles.

On arriving at Newfoundland it diverts its course, and crosses the Atlantic in two divisions. The more southerly of these proceeds eastwards to the coast of Morocco; the other passes Great Britain and Norway on its way to the Arctic Ocean, where its influence has been observed some distance beyond Spitzbergen. The limits of the stream, especially in the earlier part of its course, are discerned by the deeper blue of its waters, as well as by the masses of fog which hang about its borders. It carries along with it vast quantities of seaweed, torn away from the coral reefs in Florida Strait and the Bahama Sea. On passing within it the navigator enters a region with a different climate and supporting different forms of animal life from those of the surrounding ocean. Its temperature on leaving the Gulf of Mexico reaches 84° in summer, and when it reaches Europe its waters are from 10° to 12° warmer than those of the Atlantic. The mild climate of Western Europe, as compared with other regions in the same latitude, must in large measure be ascribed to its influence, as well as to the general prevalence of south-westerly winds.

The origin and characteristics of the Gulf Stream may be understood from the general theory of ocean-currents. The surface water of the North Atlantic sinks below the ocean-level owing to the weight arising from its low temperature, its place being taken by a warmer indraught from the south. This general tendency from north to south and south to north is, however, modified by the rotation of the earth, the different action of different winds, and the varying formation of the coast-line. The rotation of the earth makes itself felt in the following manner:—The swiftness with which an object moves eastwards varies inversely with its distance from the equator, so that the water below the surface which the indraught from the south meets in its northern movement has a continually diminishing rate of progress from west to east. But the surface-water has a tendency to retain its original speed, the result being that it strikes off in a north-easterly direction. The lower waters from the north are exposed to an opposite set of conditions, and are therefore driven towards the south-west. This double action, together with the influence of the coast-line, explains the circular course which currents often take.

The preceding account partly explains the characteristics of the Gulf Stream, but, when traced to its origin, it belongs to a different, though not altogether distinct, class of currents—those, namely, which arise through the action of winds. It is one of the two branches into which the equatorial current, produced by the trade winds, and advancing westwards from the west coast of Africa, divides after reaching the east coast of Brazil. Proceeding in a north-westerly direction through the Caribbean Sea it enters the Gulf of Mexico, and after being confined there is driven forth with greatly increased velocity through the Bahama

Sea and the Strait of Florida. It is maintained that the force of this impulse is lost long before the shores of Europe are reached, but as the waters which arrive here are certainly those which emerge from the Gulf, the name still remains applicable. There is a corresponding equatorial current with several branches in the Pacific Ocean.

Gulf-weed, or SARGASSO-WEED (*Sargassum bacciferum*), a sea-weed belonging to the order Fucaceæ, with berry-like air-bladders, but rarely fructifying. An enormous mass of detached pieces of this weed floats in the Atlantic about lat. 20° to 25° N. and long. 40° W., covering over 200,000 square miles, where it was discovered by Columbus.

Gull, any bird of the sub-family *Larinæ*, typical of the *Laridæ*, a family of sea-birds, in which the nostrils are lateral and naked, the three front toes completely webbed, and the hind toe, if present, small and set above the line of the others. There are two sub-families, *Rhynehopinæ* and *Sterninæ*. [SKIMMER, TERN.] The type genus *Larus*, with six hundred species, is universally distributed. The bill is of moderate length, with cutting edges and decurved towards the point, the wings long, and the tail square at the end. They are greedy, rapacious birds, feeding chiefly on fish and small marine animals, though the great Black-backed Gull preys upon wild fowl, and many species eat the eggs of other birds. They generally nest near the sea, often in large companies, though some breed far inland, and the commoner species may often be seen at some distance from the sea picking up larvæ and worms from newly-ploughed ground. Their power of flight is very great. The general plumage of adults of both sexes is white, with a mantle varying from bluish-grey to slaty-black, and at different times of the year there may be patches of dark feathers on the head and neck. In young birds the plumage is brownish, mottled with black and white. The peculiar cry of the gull has given it its popular name in most Teutonic languages, and this name survives in the term sea-mew. The flesh of young birds and the eggs are often eaten. The largest British species is the Great Black-backed Gull (*L. marinus*), about twenty-eight inches in length. It often occurs in large flocks, but seldom breeds in this country. The Lesser Black-backed Gull (*L. fuscus*), some five inches less, breeds in the north of England, Scotland, and on the coasts of the British Channel. The Herring or Silvery Gull (*L. argentatus*), about two feet long, is common all round our coasts. The Common Gull (*L. canus*) is only a winter visitant, but breeds in Scotland. The Black-headed or Laughing Gull (*L. ridibundus*) is abundant in the eastern counties and in Scotland. Occasional winter visitants are the Iceland Gull (*L. leucopterus*) and the Glaucous Gull (*L. glaucus*), and still rarer is Ross's Gull (*Rhodostethia rosea*), an Arctic form, with rosy-tinted plumage and a dark ring on the neck. The genus *Xema* contains the Fork-tailed Gulls, and *Rissa* the Kittiwakes, in which the hind toe is absent. *R. tridactyla*, about fifteen inches long, is widely distributed, and is one of the species whose wings

are largely used for plumes for ladies' hats. The Skuas (named from their cry, "Skui, skui") constitute the genus *Stercorarius*. They are sometimes called Parasitic or Robber Gulls from the fact that they rob other sea-birds of their prey. *S. catarrhaetes*, about two feet long, with brown plumage, generally breeds between lat. 60° and 70° N., but is an occasional visitor to the north of England.

Gumboil, alveolar abscess, inflammation affecting the tissues of the gum which overlies the alveolar processes of the jawbones, usually arises in connection with disease of a tooth. An abscess may be formed, which either bursts or may be brought to an end by evacuation of the matter which it contains. Superficial alveolar abscess, the gumboil proper, seldom calls for surgical interference, but in the case of a deep alveolar abscess, situated at the root of the fang of a tooth, the proper treatment consists in extraction of the tooth.

Gums and Gum-resins. Gums, properly so-called, are exudations from plants, soluble in water, at least in part, forming with it a mucilage insoluble in alcohol of 60 per cent., convertible by sulphuric acid into dextrin (q.v.), and with nitric acid yielding mucic and oxalic acids. They are quite amorphous, being neither organised like starch, nor crystallisable like sugar. Many of the so-called gums of commerce are, however, resins or gum-resins, these terms, like "balsam," being often very loosely employed. There is, in fact, an insensible gradation from the limpid essential oils (q.v.) to the solid resins. Attar of roses (q.v.), for instance, is an essential oil solid at ordinary temperatures, and other essential oils commonly contain varying proportions of solid substances known as *stearoptenes*, such as the camphors, dissolved in their liquid portion or *elæoptene*. When the resin is so incompletely dissolved in the essential oil as to form a viscous body, it is termed an *oleo-resin*; whilst it is proposed to restrict the term "*balsam*" to those fragrant substances (mostly oleo-resins) which contain cinnamic or benzoic acid in addition to the volatile oil and resin. True *resins* are insoluble in water, but mostly soluble in alcohol, essential oils, ether, or heated fatty oils, non-crystalline, incapable of sublimation, burning with a bright but smoky flame, and containing little oxygen and no nitrogen. A typical resin is a pale yellow, transparent solid, with a glass-like fracture and little or no smell or taste. The term *gum-resin* is a correct designation for various inspissated plant-saps, which contain both gum and resin. These definitions exclude those derivatives of the milky latex of most plants, the caoutchoucs or *rubbers* (q.v.), which are insoluble in water, alcohol, or unconcentrated acid, and are essentially mixtures of hydro-carbons containing oxidised substances or resins.

The chief classes of true gums are (i) gum arabic, (ii) gum tragacanth, (iii) cherry gum, (iv) Bassora gum, and (v) mucilage. Gum arabic is typically entirely soluble in water, and is said to be a potassium and calcium salt of gummic or arabic acid. The best, *Gum Senegal*, is the product of *Acacia Senegal* (= *A. Verek*); other kinds

are *Suakin gum*, from *A. stenocarpa* and *A. Seyal*; *Mogador gum*, from *A. gummifera*; *Babul gum*, from *A. arabica*; the *Wattle gums*, from various Australian species; and *Gum Mezquite*, from Mexican species of the allied genus *Prosopis*. Gum tragacanth, formerly called gum dragon, is only partly soluble in water. It is obtained from *Astragalus gummifer* and other species in Asia Minor. Closely similar is *Gum Kuteera* obtained from the Bixaceous *Cochlospermum Gossypium* in India and from species of *Stereulia* in tropical Africa. Cherry-tree gum, from species of *Prunus* and *Amygdalus*, is not used commercially; but *Caramania* or *Bassora Gum*, also known as *Hog Tragacanth*, which is used to adulterate true Tragacanth, is said to be of similar origin. Among the chief mucilages are those of linseed, quince-kernels, and marsh-mallow roots. They consist largely of the insoluble constituent of gums which is known as *bassorin* ($C_{12}H_{20}O_{10}$).

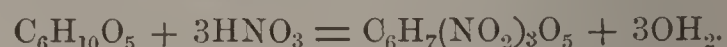
The chief gum-resins, including the fragrant *myrrh*, and *frankincense*; the fetid *ammoniacum*, *asafoetida*, *galbanum*, and *opoponax*; the medicinal *gamboge*, *guaiacum*, *copaiba* and *euphorbium*; and the extractive *seammony*, and *jalap*, are separately described.

Gumti, a river of India, which flows into the Ganges near Benares. Lucknow and Jaunpoor are situated on its banks.

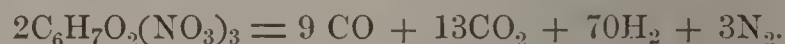
Gum-trees. [EUCALYPTUS.]

Gun-cotton. The history of gun-cotton may be said to commence in 1832, when it was observed by Braconnot that strong nitric acid acts upon woody fibre, starch, etc., with the production of a very combustible material, which was then called *Xyloidine*. Little practical result ensued, however, from this discovery till 1845, when Schonbein, by treating cotton with a mixture of nitric and sulphuric acids, obtained a new explosive substance. The manufacture of this "gun-cotton," as it was now called, was taken up in Germany, and rapidly spread into other European countries; but neglect of attention to details in its manufacture led to the gun-cotton obtained being insufficiently safe and to a number of accidents, so that it fell again out of common usage. Sir Frederick Abel, however, made so many great improvements in the production of this compound that it was again brought to the front and established as a most safe and useful explosive. The manufacture as carried out at Waltham Abbey in the Governmental factory is briefly as follows:—The best cotton waste is employed, freed from fatty oils, and is carefully selected, teased out, cut into lengths, and dried. The dried cotton is then added in small portions to a mixture of the *strongest* sulphuric and nitric acids in cast-iron pans, being left in the liquids for five minutes, when it is taken out and pressed. It is then allowed to stand for a day in pots kept cool by running water. The gun-cotton is afterwards dried by a "centrifugal" machine, revolving at a very high velocity, after which it is thoroughly washed with water and dried again as before, and boiled by steam. It is next converted into

"pulp" by a machine, "the beater," and is then transferred into large tanks, in which it is well washed in water. The gun-cotton is now tested, and, if satisfactory, is collected, and the water squeezed out. It is then compressed by great hydraulic pressure (five tons to square inch) into slabs, etc. The composition of gun-cotton thus prepared may be taken as that of *tri-nitro-cellulose*, $C_6H_7(NO_2)_3O_5$, although the quantity of NO_2 is always slightly lower than this. The equation of its formation would be then:



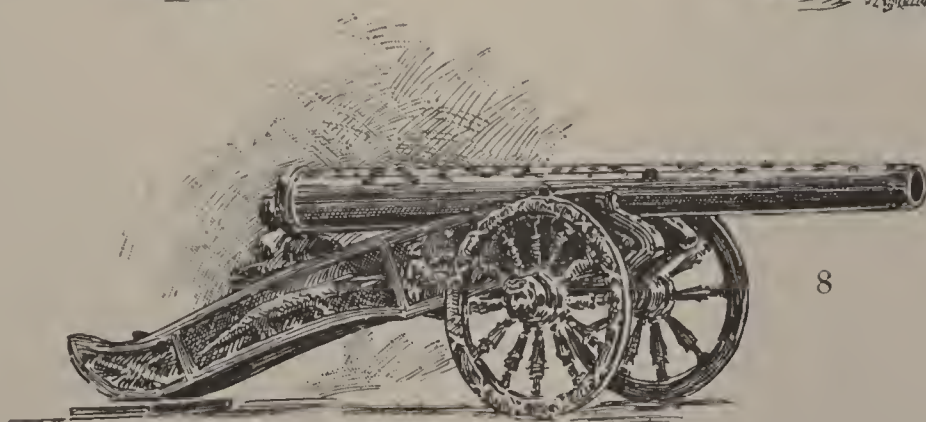
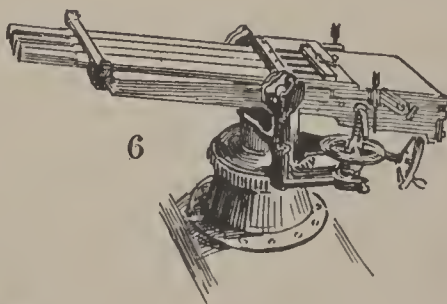
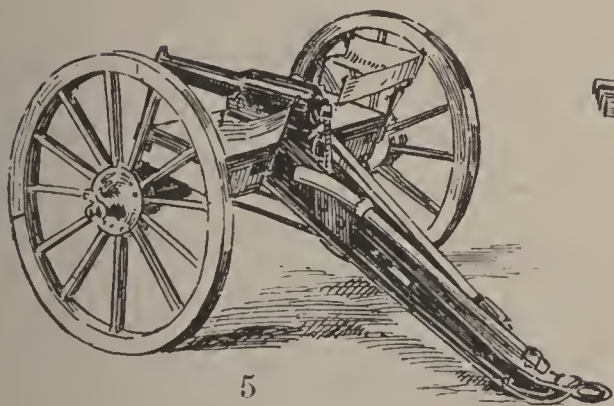
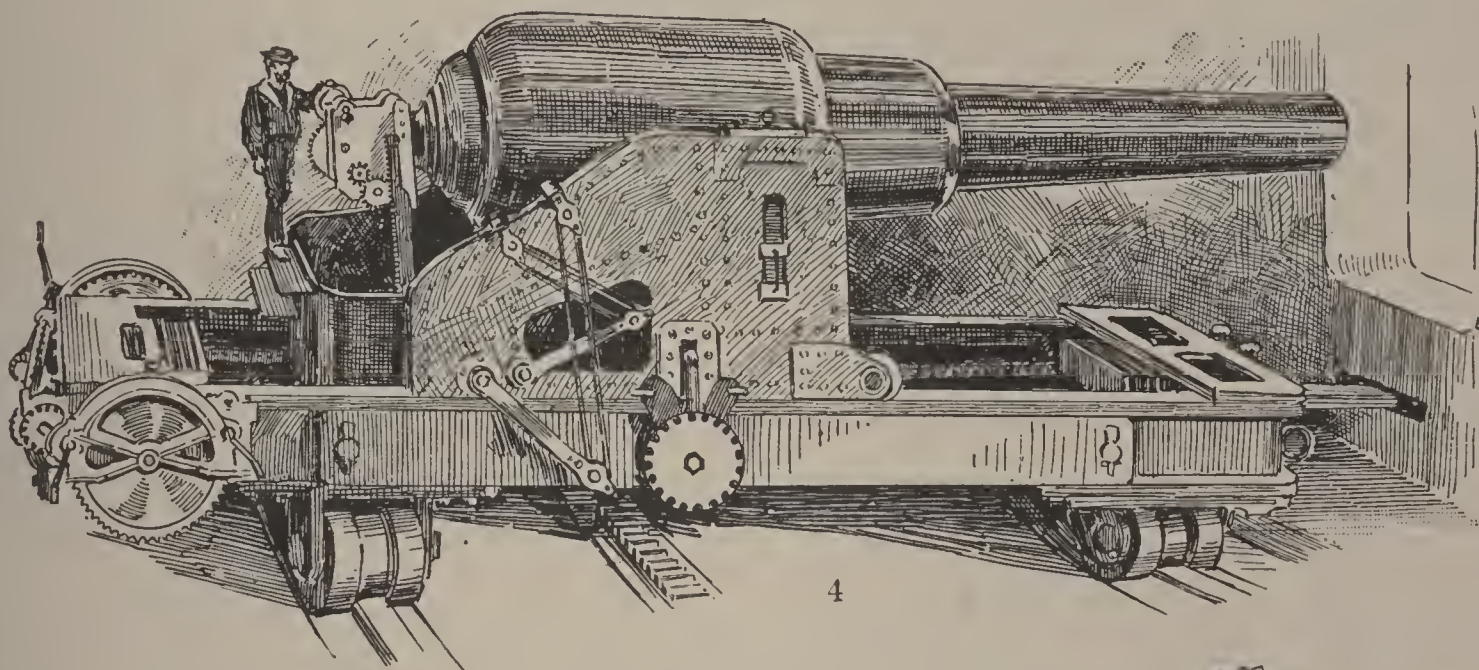
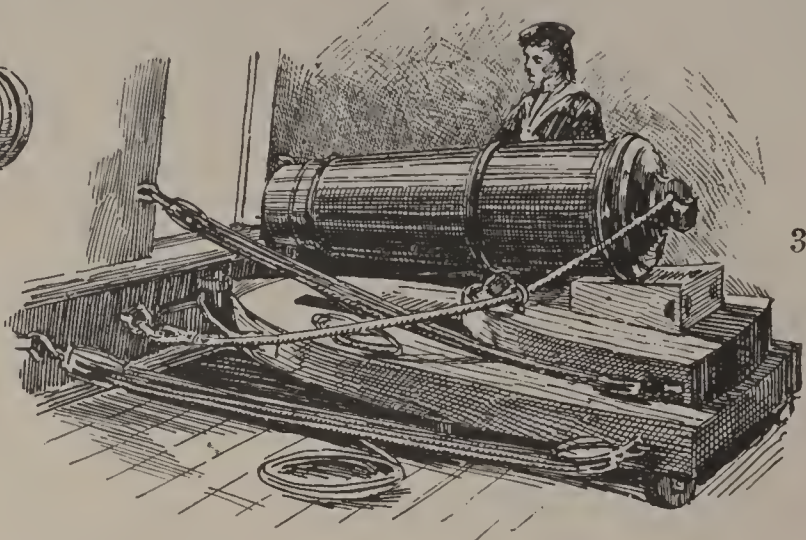
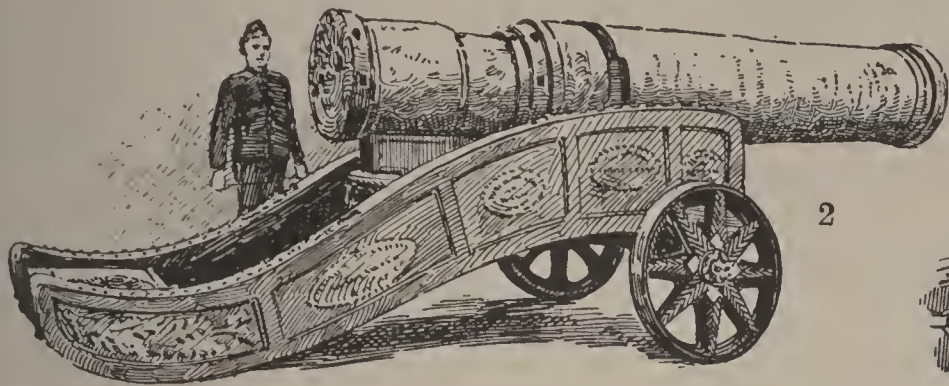
It is a solid with a specific gravity of about 1.6, is insoluble in water, alcohol, and ether. Its chemical department shows it to be a nitric ether—*i.e.* to have the composition $C_6H_7O_2(\cdot O \cdot NO_2)_3$. In the open it burns with a fierce yellow flame. It may be exploded by percussion, but, if struck, only the part directly affected explodes, the surrounding material being unaltered. It may, however be detonated if dry by the explosion of a small quantity of fulminate of mercury in contact with it, and this is the means commonly adopted to effect its explosion, the slabs, etc., having small holes drilled in them while moist to receive the fulminate. Moist gun-cotton is not readily detonated by this means, but this can be readily done by the detonation in contact with it, of the dry material. This renders the substance a very safe explosive for use, as the greater bulk can be carried moist, a smaller quantity being carried dry for "primers," which are themselves detonated by the fulminate of mercury. The decomposition which takes place when gun-cotton is exploded may be represented by the equation



It is seen that the quantity of oxygen present is not sufficient to completely oxidise the whole of the carbon—a part being only converted to the lower oxide. On this account many proposals have been made to mix with the gun-cotton a material containing excess of oxygen, as nitroglycerine, nitrates, etc., and explosives are so prepared, *e.g.* blasting gelatine.

The temperature resulting from the explosion of gun-cotton has been estimated as over double that in the case of gunpowder—*i.e.* at least 4,500° F. Its power is about three and a half times that of gunpowder, but is not as great as that of dynamite. It is very largely employed for military and naval purposes, as for submarine mines, torpedoes, etc. Many preparations consisting essentially of gun-cotton are also frequently used. *Tonite* consists of a mixture of gun-cotton with about the same weight of barium nitrate $Ba(NO_3)_2$. It is used for rock-blasting. *Schultze's Powder* consists also chiefly of trinitrocellulose, but wood fibres are employed instead of cotton for its production, and is steeped in a solution of nitre before the final drying, while charcoal may also be added. It is chiefly employed as a sporting or blasting powder.

Gun Metal, an alloy consisting of copper and tin. For smaller cannon its composition is about copper 90.5, tin 9.5; for larger guns the quantity of



GUNS.

1 Hoop Iron Gun (from wreck of *Mary Rose*—temp. Henry VIII.). 2 Mons Meg. 3 Carronade of 1800 (from H.M.S. *Victory*).
4 80-ton Gun. 5 Mountain Gun. 6 Nordenfeldt Machine Gun. 7 Mortar (French) presented by Spanish Government to
Prince Regent, 1812. 8 Gun captured in Egypt, 1801.

tin is slightly increased. It possesses in a high degree the qualities necessary for the purposes to which it is applied—viz. hardness, great tenacity, and the capability of being cast without difficulty. It is usually prepared by fusing copper, tin, and bronze with old gun metal, the two former being first fused together and added to the fused bronze and old metal. The alloy formed is kept melted for about half-an-hour and then cast in the moulds employed.

Gunnel. [BLENNY, BUTTER-FISH.]

Gunner, in the Royal Navy, a warrant officer whose duty it is to take charge of a ship's guns and ordnance stores. He receives, according to his seniority or temporary position, from 5s. 6d. to 8s. 3d. a day, and he may be promoted to the rank of chief gunner, with pay at 9s. a day. A gunner's mate is a petty officer appointed to assist a gunner.

Gunnery, the science of the construction and usage of guns, and especially of the loading, elevation, sighting, and firing of these weapons; of their ballistics, trajectories, velocities, energies, and penetrations; of ammunition and explosives, and, to some extent, of the chemistry of gases. It may now also be said to include the science of the construction of armour, of the properties of iron and steel, and of the resistance offered by earth, air, water, wood, masonry, etc. It will be readily seen, therefore, that the subject is too wide a one to be dealt with adequately here, and that reference concerning it should be made to special works. Of these the best are those which have been officially prepared for the British Government and printed for H.M. Stationery Office. They include the *Text Book of Gunnery*, the special handbooks for each of the various service guns, the *Gunnery Tables*, etc. For obsolete gunnery the student may consult *The Practical Sea-Gunner's Companion* (1747), and Thomson's translation of D'Antoni's treatises on gunpowder, fire-arms, and artillery (1789).

Gunpowder, an explosive, or violently combustible, composition of saltpetre, sulphur, and charcoal. Its invention is commonly attributed to the fourteenth century, but may be more properly ascribed to the eighth, if not, indeed, to an earlier period. Marcus Græcus gives a recipe for making it by mixing one part of sulphur with two parts of charcoal and six of saltpetre. The proportion of the different ingredients varies, however, as will be seen on reference to the following comparative statement of four samples of old military powder:—

	English.	French.	Italian.	Russian.	German.				
Saltpetre	75·0	...	75·0	...	76·0	...	70·0	...	74·8
Sulphur	10·0	...	9·5	...	12·0	...	11·5	...	11·8
Charcoal	15·0	...	15·5	...	12·0	...	18·5	...	13·4

The ingredients are ground separately, mixed, moistened with water or urine, and incorporated by grinding. The mass is then pressed into cakes, broken up into grains, and dried by steam heat. The grains are sorted by sifting, and sometimes polished by agitation with a little plumbago. The finer the grain, the more rapid the combustion.

The explosive quality of gunpowder is due to the fact that, when fired, the charcoal and sulphur burn at the expense of the oxygen in the saltpetre, with the evolution of great heat and much smoke and gas. The gases are chiefly carbonic acid, carbon monoxide, and nitrogen. The smoke consists of such solid products as sulphide of potassium, carbonite and sulphate of potassium, and unburnt sulphur. Part of this smoke remains as "fouling" in the interior of the gun, and has to be continually removed by sponging. On an average, 100 parts by weight of powder exploded in a closed space give 43 parts of permanent gases and 57 parts of solids. The temperature reaching about 4,000°, the gases occupy a volume roughly equal to 2,500 times that of the original powder. The pressure generated by powder exploded in a closed space which it completely fills is about 42 tons per square inch. The general term "gunpowder" now includes a great many compositions which do not take the form of powders. For large guns, for instance, the mixture of saltpetre, sulphur, and charcoal is made into "rifle large grain," for larger guns into "pebble" (rough cubes of about $\frac{5}{8}$ in. each way), and, for still larger ones, into "prism" (pierced hexagonal cylinders 1 inch long by $1\frac{1}{2}$ inches in maximum breadth, weighing $1\frac{1}{2}$ oz. apiece), and for rifles it is sometimes compressed into long pencil-shaped cylinders, each cylinder constituting a single charge. Moreover, many of the so-called modern powders are not only not powders but are not composed of the old ingredients. Among these are some of the smokeless powders, Cordite (q.v.), etc.

Gunpowder Plot, a plot formed by a party of Roman Catholics early in James I.'s reign to blow up the King, Lords, and Commons with gunpowder. The conspirators were Robert Catesby, who had taken part in Essex's conspiracy, John Wright, and Thomas Winter. Guy Fawkes, a soldier in the Spanish army, was sent for from Flanders, and entrusted with its execution. Other members were Thomas Percy, John Grant, Winter's brother Robert, and Catesby's servant Bates. Three rich Catholics, Sir Everard Digby, Ambrose Rookwood, and Francis Tresham, were later admitted to the confederacy. The attempt was to be made on November 5, 1605, the day on which Parliament would meet. Tresham, anxious to save his relative, Lord Monteagle, sent him a letter warning him of the danger (October 26), which was shown to Robert Cecil. The Lord Chamberlain found a pretext for visiting the cellar with Monteagle on the afternoon of the 4th. There Fawkes was found, keeping guard over the barrels. He was seized about midnight as he was returning to his post. The remaining conspirators fled, but within a few days Catesby and others had been killed, and the rest were tried and executed. The confessions of Bates implicated Garnet, the Provincial of the English Jesuits, who had been informed of the plot by another Jesuit, Greenway, though it is doubtful how far he favoured its execution. Greenway made his escape, but Garnet was put to death.

Gunter, EDWARD (1580–1626), mathematician, was educated at Oxford, and became professor of

astronomy at Gresham College in 1619. He invented the sector, with the lines called Gunter's scale, and the surveying chain, and was the first to observe the variation of the compass.

Guntur, a town in the Madras Presidency, 47 miles W.N.W. of Masulipatam.

Gurgaon, a district in the Delhi division of the Punjab, with an area of 1,940 square miles.

Gurians, a historical people of West Caucasia, whose territory lies on the Black Sea coast south of the river Rion. They are members of the Georgian family [GEORGIANS], and closely resemble the Georgians proper in usages, speech, and traditions. But there are two physical types, that of the uplands, distinguished by blue eyes and light hair, and that of the lowlands, marked by black eyes and black hair. The Gurians, originally subjects of the princes of Imeritia, acquired their independence in the fifteenth century, but were soon afterwards reduced by the Turks who were succeeded by the Russians in 1810 (Teule, *Pensées*, etc., vol. ii.).

Gurjun Oil, WOOD OIL, GURJUN BALSAM, or EAST INDIAN BALSAM CAPIVI, is a thin liquid balsam obtained from incisions in the stems of *Dipterocarpus alatus*, *D. turbinatus*, and other species in the East Indies. Its essential oil has the composition of that of copaiba (q.v.), viz. $C_{40}H_{32}$. It is imported from Moulmein, and is used in India as pitch or varnish for boats, and medicinally either as a substitute for copaiba, or externally for ulcers, ringworm, and leprosy.

Gurnard, any fish of the genus *Trigla*, of the acanthopterygian family *Cottidae*, with about forty species from tropical and temperate seas. The upper surface and sides of the angular head are bony, and the body is covered with small scales. In front of the pectoral fins are three finger-like appendages which serve as organs of touch and of locomotion, and by their means these fish crawl on the bottom, where they feed. When taken out of the water they make a grunting noise, caused by the escape of air from the swim-bladder, whence *T. lyra* is locally called the Piper, and other species are known on the Continent as Sea-cocks. Seven are British; the commonest are the Grey (*T. gurnardus*) and the Red Gurnard (*T. pini*), both valued for food. Others are Bloch's (*T. cuculus*), the Streaked (*T. lineata*), and the Long-finned Gurnard (*T. obscura*), the Piper (*T. lyra*), and the rare Sapphirine Gurnard (*T. hirundo*).

Gustavus I., King of Sweden (1496-1560), known also as GUSTAVUS ERICSSON, and after his accession as GUSTAVUS VASA, was the son of Eric, Duke of Gripsholm. In 1517 he was treacherously seized, together with other nobles, by Christian II. of Denmark, who had then reduced the greater part of Sweden. After a year's imprisonment in the Castle of Kaloe, in Jutland, he was induced by tidings of Christian's forthcoming Swedish expedition to break his parole, and made his escape to Lübeck. With the help of the Lübeckers he made his way to Calmar in May, 1520, but, meeting with

little encouragement in this part of Sweden, he withdrew into the wilder region of Dalecarlia. Here he lived for several years as a farm labourer, and gained so much influence over the neighbouring peasantry that they consented to follow him as their leader in a struggle with the Danes. His army gradually grew in strength, Upsala and other important fortresses fell into his hands, and he finally laid siege to Stockholm. In this crisis the states of the kingdom were convened, Christian was compelled to abdicate, and Gustavus was chosen king in his place (1523). His coronation took place two years later, and the crown was subsequently declared hereditary in his family. During the reign of Gustavus Sweden was raised from the low condition into which it had sunk to a state of high material prosperity. At the same time Lutheranism took the place of Catholicism as the established religion of his land, and education received a new impulse under the king's protection and care.

Gustavus II., or GUSTAVUS ADOLPHUS (1594-1632), became King of Sweden in 1611, on the death of his father, Charles IX., the son of Gustavus Vasa. He had received the best education which the times could give, and early gave proof of the restless energy, the stern force of character, and the firm adhesion to the Lutheran faith which distinguished his character in after life. At the time of his accession the country was overrun by Danish troops, but after a struggle of two years he secured a peace by which Sweden retained Gottenborg, Calmar, and Oeland. He next turned his attention to an enterprise which occupied him for the rest of his life—the establishment of Swedish sovereignty in the Baltic Sea. With this object he engaged in a war with Russia, and in 1617 he could boast that Russian vessels had been driven from the Baltic coasts. He next became involved in a war with his nephew Sigismund of Poland, the legal heir to the Swedish throne, who had been excluded on account of his adhesion to the Roman Catholic religion. This contest brought him into connection with Germany, for the Emperor Ferdinand was Sigismund's brother-in-law, and would be likely to render him aid. In 1620 Gustavus espoused the sister of George William, Elector of Brandenburg. The extension of Swedish power, the support of the German princes in their efforts to maintain their independence, and the furtherance of German Protestantism gradually formed themselves in his mind as parts of one great scheme. In 1628 he sent relief to Stralsund during its siege by Wallenstein. A treaty with Poland in 1629, which placed Elbing, Braunsberg, and Memel in his hands, left him free to take a more active part in German affairs. In 1630 he landed in Pomerania, leaving Sweden under the government of his chancellor Oxenstjerna. The aged Boguslav, Duke of Pomerania, was persuaded to promise him support and to make him his heir, and by the treaty of Bärwalde (January, 1631) a large French subsidy was secured for a period of five years; but the princes of North Germany were loath to enter on a course

which would openly sever their connection with the empire. Fear alone induced the Elector of Brandenburg to admit his troops into Spandau, and John George, Elector of Saxony, joined him too late for him to avert the fall of Magdeburg. On September 17 Tilly, the Imperial general, was defeated by a joint army of Swedes and Saxons at Breitenfeld near Leipzig. After rejecting the overtures of Wallenstein, Gustavus determined on marching to the Rhine provinces, as a centre of Protestant influence, where he might form the *Corpus Evangelicorum*, which was to take the place of the Empire. After establishing his power in the Palatinate and wintering at Mentz, he advanced in the following spring through Franconia into Bavaria. Tilly was defeated and mortally wounded at the passage of the Lech, and Gustavus entered Munich in triumph; but in the meantime Wallenstein had been recalled, and, after failing to storm his entrenchments at Nuremberg (September, 1632), Gustavus was forced to follow him into Saxony. He was overtaken and defeated at Lützen, but Gustavus himself, cut off by his rash impetuosity from the main body of his troops, lost his life in the battle. The fame of Gustavus is based on his career as the champion of European Protestantism, but he also introduced many domestic reforms which endeared him to his own countrymen.

Gustavus III., King of Sweden (1746–1792), succeeded his father Frederick Adolphus in 1771. In the second year of his reign he forced the Diet to accept a new constitution, after raising an armed force on the pretext of putting an end to the general disorder. The senators, who had previously been arrested, resigned their usurped powers into the hands of the king. Gustavus, on the whole, showed himself an enlightened ruler, although his extravagant tastes pressed somewhat heavily on the national finances. A war with Russia which broke out in 1788 led to no important results. Gustavus was preparing to join the league against the French republican government when he was assassinated in the opera-house by Captain Ankarstroem, an agent of the discontented nobility.

Gustavus IV., King of Sweden (1778–1837), succeeded his father, Gustavus III., in 1792. Having made himself very unpopular by rashly engaging in a war with Russia which resulted in the loss of Finland, he was in 1809 deposed by his nobles in favour of his uncle Charles, Duke of Sudermania. After wandering under assumed names through several European countries, he at last settled at St. Gall, in Switzerland, where he died.

Gutenberg, JOHANN (c. 1410–1468), was born of a good family at Mainz, and went from there to Strasburg. He was a man of much versatility, and devoted his energies to many objects, at one time having a scheme for polishing precious stones, at another the making of looking-glasses; but the invention which brought him renown, though little else, was the use of movable type in printing. In 1446 he was back in Mainz, where a John Fust or Faust aided him more than once with funds for

carrying on his printing. In 1445 and the following years he printed a folio Latin Bible, but his work was not profitable, and eventually he died in poverty, without children, and almost without friends.

Guthrie, THOMAS, D.D. (1803–1873), a Scottish preacher and philanthropist, was born at Brechin, and went to school there, afterwards proceeding to the university of Edinburgh, where he studied for ten years. In 1826 he went to Paris, where he studied anatomy, and in 1830 he was ordained and married. He did much for his parishioners, starting a savings-bank, a Sunday-school, and a library. In 1837 he was called to Edinburgh, where he made a great mark as a preacher. In the great split of the Church he threw in his lot with the Free Church. He did good work for his poor, being greatly instrumental in bringing about the Scottish Education Act, establishing ragged schools, and he was an earnest though not bigoted advocate for total abstinence from strong liquors. He retired in 1864. Besides publishing many works, he long edited the *Sunday Magazine*, and was a frequent contributor to *Good Words*.

Guttapercha, the commercial name for the hardened milky sap of various plants belonging to the order Sapotaceæ, native to the Malay peninsula and archipelago. The trees from which it is obtained range from lat. 6° or 10° N., to 10° S., and from long. 100° to 120° E. Being more easily so used, they have been felled in great numbers since 1842, when Dr. William Montgomerie first introduced this substance into England. Each tree yields only 12 or 13 pounds of gutta, and between 1854 and 1875 over three million trees are said to have been felled in Sarawak alone. Our imports, which rose from 4½ million lbs. in 1857 to 10 million lbs. in 1870, have since declined, now averaging about 7 million lbs., whilst, as there is a steady demand for the substance for casing submarine cables, the price has risen considerably. "Gutta" is the Malay term for gum, and "percha," the name of the island of Sumatra, the tree itself being known as "taban;" but the species from the latex in the bark of which the gutta was originally obtained, *Palaguium Gutta*, is said to no longer exist in a wild state. The best quality comes from *P. oblongifolium*, "taban marah," that mostly exported from "taban simpur," *Payena Maingayi*. The crude gum is generally exported in oblong balls of a greyish-white colour, with a slightly reddish tinge inside, weighing from 13 to 26 lbs. each. It is almost as hard as wood; but at 120° F. it becomes dough-like, and at 145° or 150° F. can be readily rolled or moulded. In Tradescant's Museum (1656) it is thus described as a curiosity:—"The plyable mazer-wood, being warmed, will work to any form." Chemically, guttapercha is a mixture of two resins, one *albin* (C₂₀H₃₂O₂), white and crystalline, and forming 6 to 14 per cent., the other, *fluavil* (C₂₀H₃₂O), yellow and amorphous and forming an equal proportion, in from 75 to 82 per cent. of a milk-white fusible hydro-carbon, containing about 88 per cent. carbon and 12 per cent.

hydrogen, known as pure *gutta*. It is used for moulds for electrotypes, in all forms of electric insulators, for boot-soles, for speaking-tubes, ear-trumpets, stethoscopes, etc. The chief substitutes as yet tested are *Pauchontea*, from *Bassia* (*Dichopsis*) *elliptica* of the west coast of India, and *Balata*, from *Mimusops Balata* of Guiana and the West Indies, both of which are products of members of the same natural order.

Guttiferæ, an order of thalamifloral dicotyledons (q.v.) comprising some thirty genera of woody plants, natives of moist situations in the tropics, characterised by their resinous juice. They have opposite, leathery entire leaves, numerous stamens, often coherent, a flesh disk, a stigma usually sessile and radiate, and exalbuminous seeds. They are generally acrid, and their resin is yellow. Among the chief genera are *Garcinia*, to which belong the mangosteen (q.v.), the kola nut (q.v.), and the gamboge (q.v.), and *Calophyllum*, which includes Poon, and other valuable East Indian timbers.

Gutzkow, KARL (1811–1878), German novelist and dramatist, was born at Berlin. He studied at the university there, and in 1831 undertook the publication of a periodical which turned out a failure. In 1832 he published *Briefe eines Narren an eine Närrin*. For a time he contributed to a periodical at Stuttgart, and in 1835 went to Frankfurt and started the *Deutsche Revue*—his next work, *Wally die Zweiflerin*, forming the starting-point of what was called “the Young Germany” movement. He was for a time imprisoned for his writings. He then married, and soon after composed a tragedy called *Richard Savage*. Other of his works were *Zopf und Schwert*, *Das Urbild des Tartuffe*, *Uriel Acosta*. In 1842 he wrote *Briefe aus Paris*, in 1850 *Die Ritter vom Geiste*, and in 1859 *Der Zauberer von Rom*. His later works fell off in power and quality.

Gützlaff, KARL FRIEDRICH AUGUST (1803–1851), Chinese missionary, was born at Pyritz in Pomerania. His desire was for missionary work, but his parents, who were poor, could not afford the training, and Karl was apprenticed at Stettin. The King of Prussia enabled him to carry out his wishes, and in 1826 he went to Batavia, where he learnt Chinese. He afterwards visited Siam and translated the Bible, and at last he went to Macao and to Hong Kong, where he translated the Bible into Chinese. One of his chief works was to train native missionaries who could carry their doctrines to regions to which Europeans were not admitted.

Guy, THOMAS (1645–1724), the founder of the hospital which bears his name, was born in Southwark. After his father's death he went with his mother to Tamworth, and was later apprenticed to a London bookseller, becoming in due course a freeman of the Stationers' Company, and, in 1668, a bookseller on his own account. For a time he printed for the University at Oxford, which was in collision with the royal printers about the question of printing Bibles. In 1695 he entered Parliament as member for Tamworth. Later he paid a fine rather than serve as sheriff, from, it was said,

motives of economy. He was penurious in personal habits, but generous and charitable to others. He built a town hall and an almshouse in Tamworth, gave money to poor relations and insolvent debtors, and relieved poor families. In 1704 St. Thomas's Hospital was greatly benefited by him. He had made a fortune by timely selling-out of South-Sea Stock, and this enabled him to carry out his design of erecting what was at first intended to be supplementary to St. Thomas's Hospital, but afterwards developed into a separate institution. Besides building and endowing this hospital, he left money to many other charitable purposes.

Guy of Warwick, a character of mediæval fiction, possibly having an origin in some traditional character whose adventures are variously related. One account makes him a son of Siward of Wallingford, who, being put to proof of his valour by his lady love, fought the Saracens, came to Athelstan at York and killed a dragon, then married, then returned to the Holy Land as a palmer, and coming back to England killed the Danish champion Colbrand who with Anlaf was besieging Athelstan at Winchester. There appears to be some possible ground for this last legend if for Anlaf we read Olaf. He then is said to have lived at Warwick as a hermit, only revealing himself to his wife by sending her a ring from his deathbed. Another account makes the real Guy of Warwick to have been a Guy Beauchamp who died in 1315. Countless ballads and romances have set forth the incidents of his adventure with a furious dun cow. Its rib is still to be seen at Warwick, together with Guy's porridge-pot, and portions of his armour.

Guyon, JEANNE MARIE BOUVIÈRES DE LA MOTHE (1648–1717), a French mystic and quietist, was born at Montargis of an aristocratic family. She was brought up when quite young by Ursulines and Benedictines, and practised many austerities. She was very anxious to take the veil, a course which her family would not allow. In 1663 she went to Paris and into society, and married M. Guyon. The marriage was not happy, and she took refuge in the indulgence of mystic fancies. In 1676 her widowhood left her more free, and in 1681 she gave herself to active religious works. In 1683 she published *Les Torrents*, and in 1684 a *Treatise on Prayer*. In 1688 she was imprisoned for heresy, but the influence of Madame de Maintenon obtained her release, and she went to live with her daughter, now married, near Paris. Fénelon and Bossuet had conferences, and Fénelon fell into disgrace for siding with her. She was afterwards banished to Blois. One of her characteristic writings was a mystical interpretation of the Song of Songs.

Guyon, RICHARD DEBAUFRE (1813–56), a soldier of fortune, was born at Walcot, near Bath. His father, a commander in the English navy, was of Huguenot descent. In 1831 the son entered the Austrian service, and, marrying the daughter of a Hungarian baron, lived for a time a retired country life. He did good service in the revolutionary

cause, and, upon the failure of the movement, went to Turkey, where he became a Mussulman and entered the Sultan's service as Kourshid Pasha. He took part in the Crimean War, and aided in organising the army of Kars.

Guy's Hospital, founded and endowed by Thomas Guy, was opened in 1725. It was further endowed by a Mr. Hunt in 1829. The income, which amounts to about £40,000 annually, is mainly derived from land in Essex, Lincoln, and Hereford. There is now accommodation for about 700 patients. The number of in-patients is about 5,000, that of out-patients about 70,000 annually. An important medical school is attached to the hospital.

Guzman-Blanco, ANTONIO, was born at Caracas in 1830. From 1863-68 he was Vice-President of Venezuela, and being driven from power he re-established himself in 1870, and though not always nominally President was the real arbiter of the country. In 1889 he was deposed while absent in Europe on public affairs.

Gwalior, a native Indian state under the control of the English Government. It consists of scattered districts, the principal of which is separated from Agra and Etawah by the Chambal. The extreme range of the state is between lat. $23^{\circ} 21'$, and $26^{\circ} 52'$ N., and long. $76^{\circ} 31'$ and $79^{\circ} 21'$ E., and it contains about 30,000 square miles. The N.E. part is level and not particularly productive, but farther S. it rises into scattered hills, on one of which is situated the fortress of Gwalior. In the middle is a plateau with an average height of 1,500 feet, and bounded on the S. by the Mandu range of mountains. The chief rivers are the Nerbudda, Chambal, and Sind. The climate is good during the hot and dry seasons, and there is abundance of wild beasts and birds, and the waters are well stocked with carp and other fish. The chief productions are opium, wheat, maize, rice, oil-seeds, ginger, sugar-cane, indigo, tobacco, and cotton, and some iron is smelted. The principal exports are opium, cotton, tobacco, dyes, and iron. The population is varied, but the ruling race is the Mahratta. The town of Gwalior is interesting as a rock fortress, the sandstone hill having been artificially rendered stronger, as being an ancient seat of Jain worship, and as possessing a palace of fifteenth-century architecture.

Gwennawi, the language of the negroes of Morocco. Most of the slaves in this region speak the Arabic dialect of their masters; but they also carefully preserve and hand down from generation to generation the Soudanese idiom, which they call *Lugha el Gwennawia*, "Language of the Blacks," which appears to be a Mandingo or Bambarra dialect.

Gwyniad, the Welsh name of *Coregonus clupeoides*, a food fish, known in the Lake district as the Schelly, and round Loch Lomond as the Powan and Freshwater Herring. When full grown it is about a foot long, with shining silvery scales. It feeds on *entomostraca*, insect larvæ, and beetles. [COREGONUS.]

Gyges, King of Lydia, dethroned Candaules and founded a new dynasty in 687 B.C. It would appear that with Carian and other mercenaries he overcame the opposition of the natives, and was confirmed in his position by the reply of the Delphic oracle. Inscriptions show him to have been a tributary to the King of Assyria, who aided him against his foes, the Cimmerians.

Gymnastics. The term "gymnastics" was applied by the Greeks to all bodily exercises, and included running and jumping, boxing, wrestling, throwing the javelin, etc. It is derived from *gymnos* ("naked"), because the performers were either nearly or completely naked. These exercises formed an important part of education in ancient Greece, and became common at Rome during the period of the Empire. During the Middle Ages youths of high rank were trained in exercises requiring physical strength and suppleness, but with the progress of the art of war they fell into disuse. The term "gymnastics" is now confined to exercises the direct aim of which is to develop the muscles and bones, especially those of the upper part of the body. The modern science of gymnastics originated in Germany as a result of the greater importance attached to physical vigour as a means of promoting the general health. Gymnastic exercises were first introduced by Johann Basedow in his school at Dessau in 1774. In 1811 a gymnasium was established at Berlin by Friedrich Ludwig Jahn, and henceforward the practice of gymnastics became general in Prussia among all classes. From Prussia it passed to Sweden, where it became an essential part of military training, and produced so marked a change in the efficiency of the Swedish troops that in 1844 the same methods were adopted by Louis Philippe in the French army. The movement spread from France to the other Continental countries. In England private gymnasia were established at Oxford (1858) and elsewhere, and at a somewhat later date gymnasia for the use of soldiers were erected at Aldershot and other military stations.

Gymnastic exercises either consist simply of movements of the limbs—a branch of the science which has received much attention in Sweden, especially at the hands of Professor Ling (1776-1839)—or artificial aids of various kinds may be used. These may be either movable, as in the case of dumb-bells and bar-bells (bars about 3 feet in length with weights at both ends), or immovable. The most important immovable appliances are the horizontal bar, which may be heightened or lowered to the required level, and the parallel bars, two bars about $2\frac{1}{2}$ ft. one from the other, and about 4 ft. above the ground. The other appliances include iron rings suspended by ropes from the roof, the trapeze-bar which also hangs from the roof, horizontal and vertical ladders, and ropes and poles for climbing. Loose flannel clothing is always worn by gymnasts.

Gymnoblastic Hydroids, an order of the Hydromedusæ, a sub-class of the Hydrozoa (q.v.). The polyps form branching colonies, which are invested with a delicate chitinous cuticle, which

does not, however, form cup-like expansions into which the hydranths can be withdrawn. Examples of the group are *Tubularia*, *Cordylophora*, *Hydraetinia*. When free-swimming medusæ are formed they possess eyes, and bear the sexual products round the manubrium; they are known as Anthomedusæ (q.v.).

Gymnolæmata, the sub-class of Bryozoa belonging to the group Ectoprocta (q.v.), including the three most important orders, the Cyclostomata (q.v.), Ctenostomata (q.v.), and Cheilostomata (q.v.). The main character of the sub-class is that the arms around the mouth are arranged in a circle instead of a horse-shoe, as is the Phylactolæmata. With the exception of the one genus *Paludicella*, they are all marine.

Gymnosomata, the order of Pteropoda (q.v.) or Sea-butterflies, in which there is no shell in the adult.

Gymnosperms, the lower of the two divisions of flowering plants or spermatophytes (q.v.), comprising a single class, the *Gymnospermia*, the living representatives of which, some 400 species referred to about 40 genera, are grouped in three natural orders, the *Cycadeæ*, *Coniferæ* (including *Taxineæ*) and *Gnetaceæ*. Though including plants differing widely in mode of growth, these three orders have many characters in common, and exhibit intermediate conditions between the Pteridophytes and Angiosperms. On the one hand, they approach the Lycopodiæ, especially *Isoetes* and *Selaginella*, in some respects, and the Equisetina in others, so that we can only derive them from some common ancestor of the pteridophytes, whilst on the other hand they approach dicotyledons rather than monocotyledons. They are all woody plants with exogenous stems, which seldom branch in the cycads, but do so freely in conifers. They increase in diameter by a ring of cambium, but the medullary rays are invisible, being often only one cell broad, and tracheids, or elongated cells with bordered pits, take the place of vessels in the secondary wood, *i.e.* in the rings of wood formed by the cambium. An apical meristem of numerous small cells replaces the large apical cell of most of the higher cryptogamia. The leaves are generally simple with one vein, and do not all produce axillary buds. The flowers are always unisexual, seldom have even the rudiment of a perianth, and have generally an elongated axis, which with its sporophylls is known as a *cone*. The pollen-sacs or microsporangia are produced separately on the under surface of the staminal leaves or male sporophylls, and the pollen grains show their affinity to the microspores of lower groups by undergoing division into two or more cells, one or more of which (the *included cells*) form a rudimentary male prothallium, whilst the pollen-tube is given off by another. Carpels are sometimes absent, as in the yew, and when present do not form an ovary, style, or stigma, whence the ovules are naked, from which character the group derives its name. The ovules may be terminal or (in *Gingko*) lateral axial structures, or may be marginal

lobes of an open carpellary leaf, as in *Cycas*, or may be in the axils of the carpels, as in cypress and juniper, or on peculiar placental structures, as in the *Abietineæ*. The embryo sac or microspore is at some distance below the apex of the tercine, has a thickened wall or *exospore*, and is filled before fertilisation with an *archisperm* on the upper surface of which several *archegonia*, formerly known as "corpuscula," are formed. There being no stigma or style, the pollen-grain, carried by wind, falls directly into the micropyle; but its pollen-tube, after penetrating a little way into the tercine, commonly pauses for a considerable time, often for months, before growing on to the top of the embryo sac. Several embryos are frequently developed from one seed, either from the fertilisation of the oosphere or central cell of more than one archegonium, or from a division of the *suspensor* (q.v.) which results from the fertilisation of one, each division bearing an embryo (*polyembryony*). Coniferous wood occurs fossil in Carboniferous rocks, and to the same period belong the *Cordaiteæ*, a group possibly intermediate between cycads and conifers. But we may expect further light on the affinities of the now isolated groups of the Gymnospermia from future palæontological discoveries. [CYCADS, CONIFERÆ, WELWITSCHIA.]

Gymnotus, a genus of eel-like fishes, with one species (*G. electricus*), the electric eel, about six feet long, from the rivers of Brazil and Guiana. There are no scales, or caudal or dorsal fins, and the anal reaches to the end of the tail. It is the most powerful electric fish known.

Gynandrophore, an elongation of the floral axis within the flower below the stamens, so that both andræcium and gynæcium are carried upon a stalk. This structure is but rarely developed and gives the name *Gynandropsis* to a genus, allied to the capers, in which it does occur.

Gynandrous, having the andræcium and gynæcium, *i.e.* the stamens and carpels, adherent into a column or *gynostemium* in the centre of the flower, as in orchids and Asclepiadaceæ. Such plants were placed by Linnæus in a class *Gynandria*.

Gynobasic, springing from the base of the ovary, a term applied to the style of united carpels when, owing to the greater development of their ovarian portions towards the outside or periphery, the style rises from the centre of a depression within the ring of carpels. It occurs markedly between the four divisions which result from the two carpels in the Labiata and Boragineæ. [REGMA.]

Gynophore, an elongation of the floral axis below the ovary, *i.e.* between the stamens and the ovary. We have such a structure in the passion-flowers, in the genus *Alechemilla*, and notably in the capers (*Capparis*), besides other instances.

Gynostemium. [GYNANDROUS.]

Gypsies, the English name of a nomad people of undoubted Indian origin, who, about A.D. 1000,

began to move in probably several waves of migration from the Indus valley westwards through Afghânistân, Persia, Asia Minor, and Syria to Europe, where they first made their appearance in the 14th century. The course of their wanderings can be followed through these regions, where they are still represented by the Luri, Kauli (*i.e.* Kâbuli), and Karâchi (*i.e.* "Blacks") of Persia; the Xebeques of Anatolia; the Kurpadh of North Syria; the Nowars of South Syria, and the Chinghiané of Turkey and the Levant. This last, identified by some with the Chinganes of the Lower Indus, is the most general European name, occurring in many countries under diverse modified forms; all, however, referable to the *Sekane*, which their chief, calling himself "Duke of Little Egypt," declared to be the name of his followers when summoned before the authorities of the Hanseatic Towns in 1417. Hence the German Zigeuner, the Italian Zingari, the Spanish Zincali, and perhaps also the Ἀσιγγανοί or Ἀθίγγανοί (Acingani) of the Byzantine writers, though these are heard of before the assumed date of the first migrations from India. The other European names are due to popular views regarding the origin or practices of these nomads. Such are the Scandinavian Tatars, the Dutch Heidenen ("Heathens"), the French Bohemians, those who first reached Paris in August, 1427, having probably come overland from Bohemia; lastly the Spanish Gitanos, and the English Gypsies (Gipsies), that is Egyptians, as if the first arrivals in Spain and the British Isles had been *viâ* the Mediterranean from Egypt.

But the proper tribal name always has been *Rom* (man, husband), which has been traced to the wandering low-caste *Doms* (*d* and *r* interchangeable) of North India. [DOMS.] It is noteworthy that the feminine forms of these words (*Romni*, *Domni*) correspond, and are Sanskritic, as in *rāja*, *rāni*; but all the Gypsies cannot be Doms, for many—perhaps the majority—seem to have been Jâts of Sindh, whence their alternative name *Sinti*, that is, people from the Sindhu (Indus) river. The Luri Gypsies of Persia appear to be certainly Jâts, and it was about the time of the overthrow of the Indus Jâts by Mahmûd of the Ghaznevi dynasty (1025) that probably took place the first great dispersion westwards. The two events, conquest and dispersion, seem related as cause and effect. It is also to be noticed that the Romni (Romani) language, though degraded and affected by elements from the speech current in all the lands traversed by them, is distinctly a Gaurian or Neo-Sanskritic dialect intermediate between the Panjâbi and the Sindhi. All are derived independently from the Prakrits, or vulgar Sanskrit idioms, which formed the connecting link between classical Sanskrit and the Neo-Sanskritic tongues as first represented in literature by the poet Chand. The Romni grammatical forms show that the dispersion took place while these tongues were still in process of formation, which would again point to the early part of the 11th century.

The Gypsies were first heard of in Greece (Crete) in 1322, and they soon after reached Wallachia, whence the second, or what may be called the

European, dispersion took place. This also was connected with a Mohammedan conquest, for it followed immediately after the invasion of Wallachia by the Turks in 1415; hence their first appearance (*see* above) in Germany in 1417, in France 1427, and about the same time in England. That they reached England by this overland route, and not from Egypt, as was popularly supposed, seems evident from the fact that in the English Romni dialect there are Greek, Magyar (Hungarian), Slav, German, and French elements, but no Arabic or Coptic, which must have been picked up had they passed through the Nile delta. In recent years they have crossed the Atlantic, and Gypsy encampments are already familiar sights in some of the eastern states of the American Union; for wherever they wander they tenaciously adhere to their old nomad habits, and also everywhere show the same tastes and follow the same pursuits of tinkers, horsedealers, strolling minstrels, prowlers about farmyards, just like their Indian ancestry. Nevertheless there are exceptions, and the *Tsiganes* of Bulgaria have become a sedentary hard-working peasantry, have adopted the Moslem religion, and almost forgotten their Romni mother-tongue, now speaking either Turkish or Bulgarian even in their homes; but the type has remained quite pure, and can be instantly recognised amongst the surrounding populations. But there are two types (Jât and Dom) which may be best studied in Roumania, where some are distinguished by crisp black hair, thick lips, and a very dark complexion, others by a fine profile, regular features, and a light olive complexion. Here also they are grouped in three social classes, like the Hindu castes: (1) *Laïesi*, traders and minstrels; (2) *Vatrari*, servile, employed as domestics and retainers in the great houses; (3) *Netotsi*, the so-called "Atheists," most savage and wild of all the Gypsy race. Such distinctions are not observed amongst the western Gypsies, because after the Wallachian dispersion the classes became mixed, and all, so to say, "broke caste." (C. Leland, *Proc. Philological Soc.*, March, 1879, and other writings; F. Kanitz, *Mittheilungen der Anthropol. Gesellschaft*, Vienna, 1877; J. W. Ozanne, *Three Years in Roumania*, 1878; Borrow; Miklosich.)

Gypsum, hydrous sulphate of lime ($\text{CaSO}_4 + 2\text{H}_2\text{O}$), an abundant mineral formed by the evaporation of saline waters and often occurring in extensive beds associated with rock-salt, as in the New Red Sandstone of our north-west Midlands, in the Purbeck beds, and in the Paris Eocene. When in transparent, colourless, pearly crystals, often in arrow-shaped twins, belonging to the Oblique system, it is known as *selenite* (q.v.); when fibrous and silky, as *satinspar*; and when massive and but slightly translucent, as *alabaster*. Its hardness being only 2, this latter form is commonly carved for ornaments and internal embellishments for buildings. Gypsum is a valuable manure, and is added to water to render it "permanently hard" for brewing purposes, a process known as "burtonising;" but its chief use is in the manufacture of plaster of Paris (q.v.). This substance is simply

gypsum deprived of its water by burning and ground fine. On the addition of water, chemical recombination, or "setting," takes place, accompanied with some expansion and the giving-off of heat.

Gyration. [ROTATION.]

Gyrfalcon. [FALCON.]

Gyrinidæ, the family which includes the Whirligig beetles (q.v.).

Gyroscope is an instrument intended to illustrate the phenomena of rotating bodies, generally the study of the combinations of different rotations imparted to the same body. It consists essentially of a metal wheel with heavy rim, provided with a stiff and strong axle pivoted inside a circular frame of metal as light as strength conditions will permit. A strong spin may be given to the wheel without disturbing this outer framework, which may be held by the hand during the operation. The general nature of the phenomena observed in such an instrument is indicated in the article on rotation.

H.

H, the eighth letter of the alphabet, is the Phœnician letter *cheth*, the value of which was the same as that of *eh* in the Scotch word *loeh*. Both the Greek "rough-breathing" and the Latin H were derived from *cheth*. In Anglo-Saxon H was still a guttural, but it afterwards became a spirant. In English it has disappeared before many words beginning with a consonant, as *loaf*, *neek*, *ring*, and is (in South Britain) scarcely heard in the combination *wh*, which was originally *hw*, but to this rule the word *who* forms an exception. In French, Spanish, and Italian it has been entirely lost, although in the first two the character is retained. In German musical notation the letter H denotes B natural, the letter B being used for our B flat.

Haarlem, the capital of North Holland, and one of the finest towns in the Netherlands, is 12 miles west of Amsterdam, and stands on the river Spaarne about 4 miles from the sea. St. Bavo's Kerk, built in the 15th century, contains a renowned organ with 8,000 pipes. The Teyler Institution has, besides a fine library and observatory, an excellent collection of physical instruments. In Haarlem Hart (wood) stands the royal palace of Welgeleue. There are also an academy of sciences, and royal schools for teachers and clinical surgery. The town, through which run several canals besides the river, is a centre of the trade in bulbs and seeds. Silk, velvet, carpets, and Haarlem *boutjes* (a mixture of linen and cotton) are manufactured. The history of Haarlem goes back to the 12th century. It forfeited its privileges by siding with the peasants in 1492, and in the religious struggle of the 16th century stood a siege of seven months by the Spaniards, who subsequently perpetrated horrible outrages on the survivors.

Haarlem Lake, which was drained by an English company employed by the Government between 1839 and 1852, was formerly a lagoon connected with the Zuyder Zee. In 1836, when its area was nearly 50,000 acres, the lake overflowed, and caused much damage in Amsterdam and Leyden. From the clayey soil at the bed of the lake, "klinkers" or paving-bricks used to be made.

Habab, a powerful pastoral people, of north-east Abyssinia between the Bogos (Bilen) and Beni-Amer south and north, and north-west of Massowa. Their territory, which is now included in the Italian colony of Eritrea, occupies the strip of coastland between lat. 16° and 17° 30' N. and the neighbouring plateau as far inland as the Falkat river separating them from the Beni-Amer; area 2,500 square miles, population 70,000 to 80,000. The Hababs appear to have been originally a southern branch of the Bejas [BEJA], whom they still resemble in their physical appearance and nomad usages; but having later been brought under Abyssinian influences, probably during the flourishing period of the Axumite empire, they now speak a Geez dialect [GEEZ] closely akin to that of the neighbouring kingdom of Tigré. They were also within recent times nominal Christians recognising the authority of the Abyssinian Abuna (Patriarch), but are now for the most part Mohammedans, like their Beni-Amer neighbours and kinsmen. Like all these north-eastern nomads, they have their winter and summer stations, camping from June to October on the Nakfa plateau (4,000 to 6,000 or 7,000 feet above the sea), and then descending with their numerous herds and flocks to the grazing-grounds of the Sahel ("coastlands"). Over their territory are scattered many curious monolithic monuments which have not yet been studied by archaeologists, and which they attribute to the Bet Maliyeh aborigines, many of whom still survive in the country. (W. Munzinger, *Gebiete der Beni-Amer und Habab* in *Petermann*, 1872; Von Heuglin, *Le Territoire des Beni-Amer et des Habab* in *Bull. de la Soc. Khediviale de Géographie*, 1876.)

Habakkuk ("The Embracing"), one of the Jewish minor prophets, the date of whose work is placed by Delitzsch, on grounds of internal evidence, in the 12th year of Josiah, or 630 B.C. Other commentators consider him to have lived in the reign of Jehoiakim, son of Josiah, at a later period in the 7th century.

Habeas Corpus is a writ by which the personal liberty of the subject can be enforced. By the Petition of Right (3 Charles I.) it is expressly declared that no freeman shall be imprisoned or detained without cause shown, to which he may make answer according to law, and by the 16th Charles I. c. 10 it was enacted that if any person should be restrained of his liberty by order or decree of an illegal court, or by command of the King's Majesty in person, or by warrant of the Council Board or of any of the Privy Council, he should, upon demand of his counsel, have a writ of *habeas corpus* to bring his body before the Court of

King's Bench or Common Pleas, and such court should thereupon determine whether the cause of his commitment were just, and should forthwith do as to justice should appertain. And by Statute 31 Charles II., c. 2, commonly called the "Habeas Corpus Act," amended and made more effectual by the 56 George I., c. 100, the methods of obtaining the writ of habeas corpus are so plainly pointed out and enforced that, so long as this statute remains unimpeached, no subject of England can be long detained in prison, except in those cases in which either the general law requires and justifies such detention, or else some special legislation (always regrettable) has been found necessary so to provide in exceptional circumstances. Moreover, lest the habeas corpus should be evaded by demanding unreasonable bail or sureties for the prisoner's appearance, it is declared, by a statute passed in the first year of the reign of William and Mary, that excessive bail ought not to be required, though, on the other hand, to prevent such abuses as are usually apt to occur in the resort to a writ of this description, it is a rule with the courts that they will not grant a habeas corpus as of course or without probable cause shown.

Of great importance to the public is the preservation of this personal liberty. If even the highest magistrate could imprison arbitrarily whenever he or his officers thought proper, as in pre-Revolutionary France was the frequent practice of the Crown, there would soon be an end of all other rights and immunities. Indeed, some have thought that unjust attacks even upon life or property at the arbitrary will of the ruler are less dangerous to the commonwealth than such as are made upon the personal liberty of the subject. To deprive a man of life, or by violence to confiscate his estate, without accusation or trial, would be so gross and notorious an act of despotism as must at once convey the alarm of tyranny throughout the whole kingdom; but confinement of the person by secretly hurrying him to gaol, where his sufferings are unknown or forgotten, is a less public, a less striking, and therefore a more dangerous engine of arbitrary government. And yet sometimes, when the State is in real danger, even this may be a necessary measure, as has frequently happened in the administration of Ireland. But the happiness of our constitution is that it is not left to the executive power to determine when the danger of the State is so great as to render this measure expedient, for Parliament alone, when it sees proper, by suspending the Habeas Corpus Act for a short and limited time, can enable the Crown to imprison suspected persons summarily, and without the possibility of their obtaining their discharge during that period by resort to the courts, as the Senate of Rome was wont to have recourse to a dictator when they judged the Republic to be in grave and imminent danger.

Habeas corpus as a form is not known to the law of Scotland. The way in which a person imprisoned gets his trial brought on, or his release if he is not brought to trial, is there called "Running Letters."

Habington, WILLIAM (1605-1654), an English poet, the son of an antiquary (THOMAS, d. 1647), who left valuable manuscript collections concerning the history of Worcestershire, was born and died at Hindlip in that county. His chief work was a collection of poems entitled *Castara*, written in praise of his wife Lucy, a daughter of William Herbert, Lord Powys. A play by Habington, *The Queene of Arragon*, is in Dodsley's collection, and he wrote also *The History of Edward the Fourth* (begun by his father), and *Observations upon Historie*.

Hackländer, FRIEDRICH WILHELM (1816-1877), the Dickens of Germany, was born near Aachen. He was in early life engaged in trade, but also saw some service in the Prussian army. The latter experience he turned to account in his *Tales of Soldier-life in Time of Peace* (1841), and its sequel. In 1841 he went with Baron von Tübenheim to the East, and two years later accompanied the Crown Prince of Würtemberg on a European tour. In 1847, after serving with Radetzky in the Sardinian war, he wrote *Soldier-life in Time of War*. Soon after this he married and settled at Stuttgart. He wrote several comedies (*Der Geheime Agent*, etc.), but made his reputation chiefly by his *Humorous Tales*, and his novels *Handel und Wandel* (*Ups and Downs*, translated by Mary Howitt), *The New Don Quixote*, *The Dark Hour*, *Day and Night*, and *Zig-zag Stories*. He was for five years director of the royal buildings and gardens, and was ennobled in 1861 by the Emperor of Austria.

Hackney, a large parish and borough in Middlesex, to the N.E. of the City of London, containing Clapton, Dalston, Homerton, Shacklewell, Stamford Hill, and Stoke Newington, now forms part of the "County of London." The parish has an area of 3,297 acres, and the borough, which returns three members to Parliament, is 3,935 acres in extent. [LONDON.]

Haddington, the capital of Haddingtonshire, Scotland, is nearly in the centre of the county on the river Tyne, 17 miles E. of Edinburgh. It has one of the chief grain-markets in Scotland, and its abbey-church, called "The Lamp of Lothian" (*Lucerna Laudoniæ*), is of great antiquity. This royal burgh, which was several times burnt in the wars with England, was the birthplace of John Knox, and of Jane Welsh, wife of Carlyle.

Haddingtonshire, or EAST LOTHIAN, a maritime county in the south-east of Scotland, having Midlothian as its western and Berwickshire as its southern boundaries. It has a coast-line of more than 30 miles from Musselburgh on the Firth of Forth to the border of Berwickshire on the North Sea. The area of the county is 280 square miles. Large crops of wheat, beans, and "Dunbar reds" (potatoes) are obtained. There are fisheries at Dunbar and in the coast-villages. The chief towns are Haddington, Dunbar, North Berwick, and Musselburgh. The county sends one member to Parliament.

Haddock, the surname of a distinguished naval family. SIR RICHARD (d. 1715) fought at the battle of Solebay, in 1672, and was wounded. He was knighted in 1675, made commander-in-chief in the Medway in 1682, and in 1689 appointed Controller of the Navy, a post which he held until 1714. NICHOLAS (1686–1746) took part in the victory off Cape Passaro. He attained flag-rank in 1734, and in 1738 was made commander-in-chief in the Mediterranean.

Haddock (*Gadus aeglefinus*), a common but very important British food-fish of the Cod family, ranging round the coasts of Europe, without entering the Baltic or Mediterranean, and across the Atlantic to the eastern coasts of North America. In shape the haddock resembles the cod (q.v.), but is of much smaller size, from two to four pounds being the general weight, though much larger specimens are on record. In higher latitudes fish three feet long have been met with, but those taken around our own shores are about a foot in length. The general colour is greyish-white above, and the white belly is mottled with grey. The lateral line is black, and the dark spot above the pectoral fin has led to the identification in folklore of this fish with that from which St. Peter took the tribute-money. Haddocks are taken with trawl-nets and long lines. The best smoked haddocks (*Finnon haddies*) come from the fishing village of Finnon or Findon six miles south of Aberdeen.

Haddon Hall, a fine old mansion, belonging to the Duke of Rutland, is on rising ground near the Wye, 23 miles N.N.W. of Derby. It has previously belonged to two other noble families, and is mentioned in *Pevensey of the Peak*. An illustrated account of it is to be seen in two works by Cattermole.

Hade. [FAULT.]

Haden, FRANCIS SEYMOUR (b. 1818), a talented etcher and writer on etching, was born in London and educated at University College and the Sorbonne, Paris. He practised for some years as a surgeon at the West-End, and became F.R.C.S. in 1857. His first important etchings were produced about 1858. He became President of the Society of Etchers in 1889.

Hadendoa, HADENDOWA, a large branch of the Beja Hamites [BEJA], whose territory extends from the foothills of North Abyssinia northwards to the Suakin district on the Red Sea coast. The tribal subdivisions are very numerous, some pastoral, others agricultural, with two permanent stations: Fillik on the plain east of the Herdub affluent of the Gash, and Miktinab farther south-west on the opposite side of the Herdub. Under the Egyptian rule, before the Mahdi's revolt, Miktinab was the official capital and residence of a hereditary prince whose authority was recognised from Tokar below Suakin southwards to Kassala and throughout Taka, three-fourths of whose inhabitants are Hadendoa. In Munzinger's time (1870) they were said to number as many as a million; but they were greatly reduced during the Mahdist troubles (1884–92),

when they were in frequent collision with the British forces holding Suakin. They are a fierce, warlike people who still speak the Beja (Hamitic) language, though many of the chiefs understand Arabic and claim Arab descent.

Hades, in Greek mythology, was the name of the nether world, the abode of the dead, and also that of the god who ruled there, Pluto, the brother of Zeus.

Hadley, JOHN (1682–1744), inventor of the reflecting quadrant, was from an early age a proficient in mechanics, and took out a patent for a water-wheel. In 1717 he became a fellow of the Royal Society, and was afterwards Vice-President. In 1719 he made the first serviceable reflecting telescope, and in 1730 the idea of his great invention seems to have occurred to him at the same time as it did to Newton. Hadley was intimate with Sir Hans Sloane, near whom he had a house in Bloomsbury. His brother GEORGE (1685–1760) was the first to formulate the now accepted theory of the trade-winds.

Hadley's Quadrant, or the REFLECTING QUADRANT, was introduced by John Hadley in 1731 to take the place of the backstaff, or Davis's quadrant. It was formerly used for taking the altitudes of the sun and stars, and for taking angles in surveying. Its form was that of an octagonal sector of a circle. The arc, therefore, contained 45°, but, there being double reflection, the limb was divided into 90°. The quadrant is now superseded by the sextant.

Hadramaut, the name given to a strip of coast in the south of Arabia, to the north-west of Aden; but the whole of the country to the south of the desert is often so-called on the maps. The chief town is Makulla. Coal and copper abound in this country.

Hadrian. PUBLIUS ÆLIUS HADRIANUS (76–138), fourteenth Emperor of Rome, was born in the imperial city. He was the son of a cousin of the Emperor Trajan, and was in great favour with Plotina, his wife. He had held several offices and was in command of the army in Palestine when he was summoned to receive the purple in 118. He spent the next sixteen years in visiting every part of his dominions. Having repelled the attacks of the barbarians beyond the Danube and put down a conspiracy at Rome, he crossed over to Britain and provided for its protection from the Caledonian tribes by fortifications and stations. After passing through Gaul and Spain he hurried to Parthia and intimidated Chosroes into submission. He paid several lengthy visits to Athens, and also stayed some time at Alexandria and Antioch. He discouraged persecution of the Christians; but he put down a revolt of the Jews with great severity, and in 133 Jerusalem was occupied as a Roman colony, and named Ælia Capitolina. Hadrian's last four years were spent at Rome, where he built a mausoleum for himself; the ruins of which remain, and restored the baths of Agrippa, the Temple of Augustus, and other buildings. He selected as his successor Ceionius Commodus Verus, and when the latter died adopted T. Aurelius Antoninus (q.v.).

Hadrian was one of the greatest of the emperors. He showed generally a forbearing temper, but the sufferings of his later years may have irritated him into some of those acts of cruelty of which he has been accused. Hadrian's address to his departing spirit has in itself made his name famous.

Hadrian's Wall, a stone wall, with a ditch on the north and a *vallum*, or line of ramparts, on the south, extends from what is now Bowness, on the Solway Firth, to the mouth of the Tyne. Considerable remains are still to be seen, the wall in some places being nine feet in height. Two accounts of it have been written by Dr. Collingwood Bruce.

Haeckel, ERNEST HEINRICH (b. 1834), the great German biologist, was born at Potsdam and educated at Würzburg, Berlin, and Vienna. He settled at Jena in 1861, and became professor of zoology there in 1865. In the following year he met Darwin in London. He has travelled for the purpose of zoological research from Norway to Ceylon, and has also visited Madeira and the Canary Islands. His monograph on the Red Sea corals (1876) was the result of an exploration undertaken in 1873. The chief of his other monographs are *The Radiolaria* (1862) with which is given an elaborate atlas, that on calcareous sponges (*Kalkschwämme*, 1872), and the work on jelly-fishes (*System der Medusen*, 1879); while he also made contributions to the *Challenger* reports. Among his more general works are *Generelle Morphologie*, *The Natural History of Creation*, and *Anthropogenie*. Haeckel was the first German who accepted the Darwinian theories, and he has done more than anyone to popularise them. For a detailed exposition of his views see EMBRYOLOGY, HEREDITY, etc.

Hæmatemesis (from two Greek words signifying vomiting of blood). This term, as its etymology signifies, is applied to the act of bringing up blood from the cavity of the stomach. It is by no means so simple a matter as might at first sight appear to distinguish the source of blood brought up through the mouth, and hæmoptysis (q.v.) and hæmatemesis are not infrequently confused the one with the other. Blood brought up from the stomach has not usually the bright red colour possessed by that which comes from the lungs, nor is it so intimately mixed with the expectorated mucus. If blood remains in the stomach for a sufficient length of time to enable the digestive juices to act freely upon it, it acquires the appearance of coffee grounds. Hæmatemesis may be due to gastric ulcer, or to cancer of the stomach. It is also common in association with the congested state of the gastric mucous membrane which exists in *cirrhosis* of the liver.

Hæmatin, a coloured material formed by the decomposition by acids or alkalis of the *hæmoglobin* (q.v.) of the blood. It is usually obtained as a scaly mass of a blue-black colour, which when powdered appears dark-brown. The generally but not universally accepted formula for the substance is $C_{34}H_{35}N_4FeO_5$. It is sometimes found in the faeces, and in certain poisoning cases in the urine.

It is usually identified by the spectroscopic examination of its solution.

Hæmatite, so named from the Greek *haima*, blood, from its red streak, is the mineral sesquioxide of iron (Fe_2O_3), containing, when pure, 70 per cent. of iron and 30 per cent. oxygen. When crystalline it belongs to the Rhombohedral system, occurring in rhombohedra and tabular crystals of an iron-black or steel-grey colour, sometimes with a splendid metallic lustre, when it is known as *specular iron-ore*, such specimens from Elba having been employed by the Romans as hand-mirrors (*specula*). Its hardness is 5.5 to 6.5, and its specific gravity 4.5 to 5.3. In very thin plates it appears red by transmitted light, and it has a cherry-red streak. In an earthy condition it is known as *red ochre* or *redde*, and is used as a paint in crayons and in polishing glass. Hæmatite also occurs commonly in mammillated masses with a radiating internal structure, known as *kidney-iron-ore*. It is sometimes magnetic. Hæmatite is one of the chief iron-ores. It occurs, replacing calcite, in pockets and fissure-lodes, in the Carboniferous Limestone, in Furness, and to a less extent in Cumberland, South Wales, Devon, and Cornwall. It is imported from Spain. Pilot Knob, Missouri, is a hill 700 feet high, almost entirely hæmatite, and a large part of Gellivard in the north of Sweden is similarly made up of this ore. It occurs in lavas at Vesuvius and Ascension.

Hæmatocoele, a swelling produced by effusion of blood into one of the internal cavities of the body.

Hæmaturia, the occurrence of blood in the urine. This symptom may be due to disease (injury, inflammation, calculus, cancerous growth or parasites) affecting the kidney, ureter, bladder or urethra. It occurs also in consequence of the use of certain drugs, and a variety of hæmaturia, paroxysmal hæmaturia, deserves special mention. In this last-named disease, which is very uncommon, the attacks of hæmaturia occur at irregular intervals, and are accompanied by shivering fits.

Hæmatoxylin is the colouring material to which logwood owes its importance for dyeing purposes. When first discovered it was known as "hæmatin," but this name was changed owing to its application to another totally different substance. It is obtained by extracting logwood with ether, allowing the solvent to evaporate and recrystallising the product from its hot aqueous solution. It then forms colourless or slightly yellow crystals easily soluble in alcohol, ether, or hot water. It possesses a sweet taste, and its composition is represented by the formula $C_{16}H_{14}O_6$, but its constitution is not yet well determined. If oxidised, as by exposure to air, it yields a red-brown powder, *hæmatin*, of composition $C_{16}H_{12}O_6$. Hæmatoxylin, in the form of extract of logwood, is largely employed for dyeing blacks and blues upon fabrics. Iron or chromium mordants are usually employed, but the colours obtained are unfortunately comparatively fugitive if exposed to light. It is also used for staining microscopic objects and animal tissues.

Hæmin, a substance which can be manufactured from blood. Its importance is due to the fact that it forms characteristic crystals which can be readily recognised under the microscope. If a small portion of dried blood, or of material in which the presence of blood be suspected, be finely powdered with a little common salt, placed on a glass slide, treated with a few drops of glacial acetic acid, and then heated to dryness, microscopic examination will show a number of dark brown rhombic crystals; the formation of these hæmin crystals thus constitutes a very delicate test for the presence of blood.

Hæmoglobin, the constituent of the red corpuscles of the blood, to which their chief importance as oxygen carriers in the human economy is due. It occurs to a variable extent in *venous* blood, but in *arterial* blood it only exists loosely combined with oxygen as *oxy-hæmoglobin*. Its chemical composition has not as yet been definitely ascertained. It may be obtained in crystals which ordinarily appear of a dark red or purplish colour, but the hue varies with the direction of the light. [PLEOCHIVISM.] With a number of gases, other than oxygen, hæmoglobin can also enter into combination—as *e.g.* with carbon monoxide, nitric oxide—forming compounds resembling oxyhæmoglobin. [BLOOD.]

Hæmophilia, or HÆMORRHAGIC DIATHESIS. The subjects of this disease display a tendency to lose large and even alarming quantities of blood on very small provocation. Thus a mere scratch may produce considerable hæmorrhage, and even the smallest operations, such as the extraction of a tooth, cannot in persons who suffer from the malady be undertaken without considerable apprehension. Hæmophilia is eminently hereditary, and generally affects the males of a family while the females escape. Though the female portion of a “bleeder family” do not themselves suffer from the disease, they transmit it to their male offspring.

Hæmoptysis (from two Greek words meaning spitting blood). This symptom is to be distinguished from hæmatemesis (q.v.). In hæmoptysis the blood comes from the lungs or the air passages, not from the stomach, as is the case in hæmatemesis. Hæmoptysis may be due to inflammation, ulceration, or cancerous or tubercular disease affecting the larynx, trachea, bronchii, or substance of the lung itself. In rare instances an aortic aneurism may burst into the air passages. Lastly pulmonary apoplexy may be mentioned, in which disease effusion of blood occurs in the texture of the lung, and the extravasated material is partly coughed up and partly accumulates in the tissues. Hæmoptysis is oftentimes the first symptom of consumption, that is, of the deposit of tubercle in the lung.

Hæmorrhage. [BLEEDING.]

Hæmorrhoids. [PILES.]

Hafiz (“one learned in the *Hadiths*,” or sayings of Mahomet) is the name generally given to Shems-ed-Din, the great lyrical poet of Persia.

Little or nothing is known of his life, but he is thought to have died about 1388 A.D. He was said to have received his inspiration from El Khizar, a mythical saint, who gave him a draught of the water of life. So sweet were the contents of his *Divân* that the author of the collection was called *Chagarlab* (“sugar-lip”) by his contemporaries. He also obtained the name of *Lishan-ed-Ghayl* (“voice of mystery”) from the fact that his beautiful images were held to imply the mystic doctrines of Súfi philosophy. An English translation of a selection from the *Odes* of Háfiz was made in 1802 by Richardson from a Latin version; and Sir William Ouseley, Bicknell, S. R. Robinson, and others, have translated specimens. The whole *Divân* has been rendered into German, but no complete English version has yet appeared.

Hag (*Myxine glutinosa*), the popular name for an aquatic chordate animal, the type of a family (*Myxinidae*), to which the name is often extended, and which, with the Lampreys, makes up the order Cyclostomata or Round-mouths. The eel-shaped body is scaleless, the single nasal aperture is immediately above the mouth, which is furnished with four pairs of barbules; there is one tooth in the middle of the palate, and two rows of comb-like teeth on the tongue. Along each side of the body forming a bead-like chain are glands which pour forth the mucus from which these creatures derive their generic and specific names. In the genus *Myxine*, with three species, there is one external branchial aperture on each side of the abdomen, leading by six canals to as many gill sacs. In the only other genus (*Bdellostoma*) with two species there are at least six such apertures on each side, each communicating directly with a separate gill sac. The distribution of the family corresponds with that of the cod family, upon which the hags prey, penetrating into their bodies and feeding on their flesh, whence the common species is also called the Borer.

Hagen, a trading town in the Westphalian coal-district, 12 miles N.E. of Elberfeld-Barmen. Iron-founding and puddling, and the manufacture of iron and steel goods, cotton, cloth, and leather, are its chief industries.

Hagenau, a town in Elsass-Lothringen, situated in a forest and standing on the Moder, is 21 miles (by rail) E.N.E. of Strasburg. Hops and wine are the chief articles of trade, and porcelain-stoves are manufactured. The churches of St. George and St. Nicholas date from the 12th and 13th centuries respectively.

Hagenbach, KARL RUDOLF (1801–74), theologian, was born at Basel and studied at Bonn and Berlin. He was appointed professor of theology at Basel in 1824, and was author of *Kirchengeschichte bis Zum 19 Jahrhundert*, *Encyklopädie und Methodologie der theologischen Wissenschaften*, a book on the history of dogmas which was translated into English, several biographies of ecclesiastics and other works.

Haggard, HENRY RIDER (b. 1856), novelist, was born in Norfolk. He was in South Africa from

1875 to 1879, at first as secretary to Sir H. Bulwer in Natal, and then with Sir Theophilus Shepstone in the Transvaal. After his return to England he published *Ceterayo and his White Neighbours* and a series of novels, the first of which to attain popularity was *King Solomon's Mines* (1886). Others are *She* (1887), *Jess* (1887) and *Mr. Meeson's Will* (1888), *Allan Quatermain*, *Nada the Lily*, *Eric Brighteyes*.

Haggis, a Scotch dish made of the heart, liver, lights, and other internal parts of a sheep, which are minced with onions and suet, and after oatmeal, salt, and pepper have been added, are sewn up in the large stomach-bag of the sheep, and boiled for about three hours.

Hagiolatry, a general term including ancestor and manes-worship and devotion to departed saints. [SAINT.]

Hague, THE (S' GRAVENHAGE, "the Count's Hedge"), the capital of South Holland and seat of the Dutch government, is on a branch of the Leyden and Rotterdam canal, 15 miles N.N.W. of the latter town, and 33 miles S.W. of Amsterdam. Originally a hunting lodge of the Counts of Holland, it became in 1584 the meeting-place both of the States of Holland and the States-General, as well as the residence of the Stadtholders. In the next two centuries it was also an important diplomatic centre. The city is beautiful in appearance, the canals, shaded by rows of linden-trees, having a picturesque effect. The picture-gallery contains a valuable collection. There is also a museum in which are many Chinese and Japanese curiosities; a royal library, containing 4,000 MSS.; a large collection of books and coins; and many churches, the chief of which is St. James's, a Gothic building of the 14th century. In the Meermanno-Westreenen museum is a collection of early printed books. To the north of the city in the *Bosch*, or Park, stands a royal palace, to which is attached the Orange Hall. The Hague is connected by tramways with Scheveningen, a fashionable watering-place on the North Sea. Cannon-founding, copper- and lead-smelting, printing, and carriage-making are among the chief industries. Several learned societies have their headquarters in the city, which is adorned by statues of Spinoza, Bernhard of Saxe-Weimar, and several princes of the House of Orange.

Hahnemann, CHRISTIAN FRIEDRICH SAMUEL (1755-1843), the originator of homœopathic treatment, was born at Meissen. He supported himself while at Leipzig University by teaching and translating, and afterwards studied at Vienna and Erlangen. After practising as a physician for about ten years at Dresden and other places, he in 1789 began to devote himself to chemical research. While living near Leipzig he experimented on himself with Peruvian bark, with the result that he began to be led towards the conclusions on which he subsequently based his medical system. After six years of experiment he published in 1796 his essay on *A New Principle for Ascertaining the Curative Properties of Drugs*. He was prosecuted

by the State for illegal dispensing, but held his ground at Leipzig till 1821, when he was finally driven out by the apothecaries. He now resided for some years at Köthen under the patronage of the duke, but in 1835 he settled at Paris after having married a Frenchwoman as his second wife. In spite of their author's persecution, his doctrines made great progress in public opinion, patients coming for treatment from all countries. Hahnemann was the author of a book on preventive measures entitled *The Friend of Health* (1792). His statue was erected at Leipzig in 1851, where also a book on his life and works by Albrecht was published in 1875.

Haida (HYDAH), the collective name of a group of North American Indians who occupy all the islands and parts of the mainland on the N.W. coast between the Thlinkits in the north, the Carriers (Athabascans) in the east, and the Nootkas of Vancouver in the south. Their chief divisions are the Kaigani, Howkan, Klemakoan, and Kazan at the southern extremity of Prince of Wales Archipelago; the Skiddegates, Cumshawas, Laskits, and Skringwais of Queen Charlotte Islands; the Chimsyans about Fort Simpson and on Chatham Sound; the Nass and the Skenas on the rivers so named from them, the Sebasses on Pitt Archipelago and the shores of Gardner Channel; lastly, the Millbank Sound natives, including the Hailtzas, Bella Bellas, Bella Coolas, and others, with a total population of less than 10,000, scattered over a territory 40,000 square miles in extent. The Haidas speak a stock language of the usual American type, to which Powell has given the name of *Skiddigatan*, from the chief tribe in Queen Charlotte Islands. Both in physical appearance and mental qualities they differ greatly from all other American aborigines. Although the hair is black and of the general horse-tail texture, the complexion is remarkably fair—even the full-blood natives, and especially the women, having their skins as white as ordinary Europeans, so that the blue veins "are seen meandering even in the minutest branches" (Captain Dixon). They also display great skill and an exuberant fancy in their wood and bone carvings, in the heraldic devices of the tall posts set up before the dwellings of the chiefs, and especially in the elaborate tattoo-markings decorating the bodies of both sexes. These markings exhibit the family "crests" or totems, while the carved columns strikingly resemble the figures represented on the monuments of the Mayas and other Central American peoples. (Poole, *Queen Charlotte Islands*; J. G. Swan, *Tattoo Marks of the Haida Indians* in *Annual Report of the Bureau of Ethnology for 1882-83*, Washington, 1886.)

Haidinger's Brushes, in physical *Optics*, are appearances that present themselves when plane-polarised light [POLARISATION] is received into the eye under certain conditions. Thus, if the eye be rapidly directed from one image to another of an object viewed through a rhomb of Iceland spar, which is a transparent crystal that gives two images of any small object viewed through it, a pale yellow patch will appear, bounded by curved

arcs on either side, and with a violet patch contained in each set of curves. The brushes seem to be due to the fact that the eye is itself capable of polarising light, especially in the neighbourhood of the yellow spot, the coloured appearances corresponding to those that are seen when plane-polarised light is viewed through an external polarising medium.

Haiduk, or HAJDUK (Hungarian *a drover*), a Hungarian soldier, belonging to the irregular infantry, who in the 16th century carried on a border warfare against the Turks. Their adhesion to the Protestant cause was in 1605 rewarded by Stephen Bocskai, Prince of Transylvania, with the privileges of nobility, the right of self-government, and a district on the left bank of the Theiss, enlarged in 1876, and now the county of Haiduk.

Hail consists of globules of ice that fall like rain. It is more usual in spring and summer, and is observed to fall during the heat of the day. Hail rarely falls during the night. The size of the globules varies from that of a pea to that of an egg or small orange; exceptional cases have been noticed where the hailstones have weighed as much as 3 lbs. Drops of rain that are whirled upwards by an ascending current of air will form snow if lifted sufficiently high; if they are rapidly carried to a greater height they will be frozen into ice and so form hailstones. In a whirlwind they may be carried up and down alternately for several cycles before escaping the eddy and falling to the ground, and may in these separate ascents receive fresh additions of compact snow or ice. Examination of a large hailstone will generally show the different layers of which it is thus composed.

Hailes, SIR DAVID DALYRYMPLE, LORD (1726-92), Scottish judge, descended from a family of lawyers, was born at Edinburgh and educated at Eton and Utrecht. He was admitted to the Scotch Bar in 1748, was raised to the bench as Lord Hailes in 1766, and ten years later became a judge of the criminal court. He is chiefly known to posterity by his antiquarian researches, his friendship with Dr. Johnson, and his controversy with Gibbon, against whom he appeared as the apologist of Christianity. His chief works were *The Annals of Scotland*, *Memorials and Letters relating to the History of Britain in the Reign of James I.*, and an edition of *The Works of the Ever-memorable Mr. John Hales of Eaton*.

Haileybury College, 2 miles S.E. of Hertford, was from its foundation in 1809 till 1858 a training institution of the East India Company. Here Malthus and Sir James Mackintosh were once professors, and Lord Lawrence and Sir Bartle Frere cadets. In 1862 the existing public school was opened and endowed with scholarships. The number of boys is limited by the charter to 500.

Haimura (*Erythrinus macrodon*), a large fish of the family Characinidæ, from tropical America. It is the type of a group of the family distinguished by the absence of an adipose fin. Its dentition is formidable, and the natives, who esteem it for food, take it with a line and in traps.

Hainan, an island off the south coast of China forming part of the province of Kwang-tong, and being the southernmost portion of the empire. It is 185 miles long and 90 broad. Kiung-chow is the capital. Hoi-how, its port, has been open to foreign trade since 1876. Pigs, sugar, eggs, and various nuts are exported, and there are extensive fisheries. In the interior, which is mountainous, gold is found. Rice, cocoa-nuts, and sesame seeds are also among the products of the island, which is subject to frequent earthquakes. The Les or aborigines (about a third of the population) claim to be independent of the Chinese government.

Hainault, a province of Belgium, bounded on the north by Brabant and Flanders, on the east by Namur, and having France on the south and west. It is the northern part of the old countship of Hainaut, which passed successively to Bavaria, Burgundy, and the house of Austria. The present province, constituted in 1815, has an area of 1,437 square miles. The French department of the Nord once formed the southern part of Hainault, is watered by the Scheldt, the Sambre, the Dender and the Haine, and produces much wheat, flax, and beet. There are valuable coal-mines in the south, and iron, marble, and limestone are the chief of the other minerals. Large manufactures of linen, porcelain, lace, and hardware are also carried on in the towns, and the Hainault breed of horses and cattle is celebrated. The forest of Ardennes covers the greater part of the south of the province. The chief towns, Mons and Charleroi, are in the south-east.

Hair. A hair consists of an aggregation of much modified epithelial cells, and may be regarded as an outgrowth from the epidermis or outer protecting layer of the skin. Almost all parts of the skin are studded with cylindrical follicles or depressions, in each of which the root of a hair is planted. Such follicles are entirely absent from the palm of the hand and the sole of the foot, and as regards the rest of the body they vary much in number and degree of development. The appearances seen on making a longitudinal section through a well-grown hair are depicted in Fig. 1. Of the two parts of which a hair is made up, the root and the shaft, only the former is shown in the diagram. The shaft—that is, the free portion which projects beyond the skin—must be supposed to be cut away. Outside the hair-root itself several structures will be noticed. These, the various layers of the hair follicle, are described in detail in Fig. 2. Immediately external to the hair-root the diagram shows a series of layers of epithelial cells, which make up the inner and outer root-sheaths. External to these is what is called the glassy membrane, and finally outside this lies the fibrous coat of the hair sac. To return to the longitudinal section, it will be seen that the root of the hair terminates in a bulbous enlargement, the *hair bulb*, and projecting into the substance of the bulb from below is a mass of fibrous tissue containing numerous cells and blood-vessels known as the *hair papilla*. The *hair bulb* is composed of epithelial cells, and these are

continually being added to by the growth of new cells immediately over the papilla, the constant



Fig. 1.—LONGITUDINAL SECTION THROUGH A HUMAN HAIR.

1 Epidermis. 2 Mouth of hair follicle. 3 Sebaceous follicle. 4 *Musculus arrector pili*. 5 Papilla of hair. 6 Adipose tissue.

addition causing a thrusting upwards of cells previously formed, which latter become modified in appearance and converted into portions of hair substance proper. In this way a hair is continually growing as long as the hair follicle and papilla remain functionally active. After a while the two

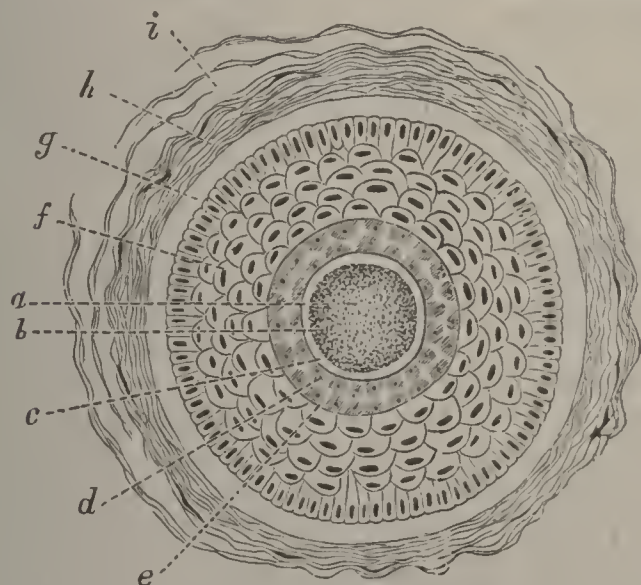


Fig. 2.—CROSS SECTION THROUGH A HUMAN HAIR AND HAIR FOLLICLE.

a Marrow of hair. b Cortex of hair. c Cuticle of hair. d Huxley's layer of inner root-sheath. e Henle's layer of inner root sheath. f Outer root sheath. g Glassy membrane. h Fibrous coat of hair sac. i Lymph spaces in the same.

latter undergo degeneration, and then a new papilla and new follicle will be found to take their

place. The hair itself consists of the delicate cuticle composed of a single layer of imbricated scales, internal to which are the fibres of the hair substance, and most internal of all is what is called the *marrow of the hair*. Two other structures deserve mention in connection with the hair follicle. There is, in the first place, the sebaceous gland or follicle depicted in Fig. 1, which secretes an oily substance which serves to keep the hair glossy; in the second place, there is the group of unstripped muscular fibres (*musculus arrector pili*), which by their contraction drag upon the hair follicle and make the hair stand erect. This system of muscles is much more highly developed in the lower animals than in man.

Hair-dressing. Savage races, and up to a late period civilised nations also, exhibit great variety in their modes of dressing the hair. Among the more remarkable peculiarities may be mentioned the Chinese pig-tail and the Moslem practice of shaving the head with the exception of a small tuft by which the wearer may be lifted into Paradise. But these monstrosities appear natural and simple beside the head-dresses in vogue in Europe in the 18th century, in which the French set the fashion. The tax on hair-powder and the taste for simplicity in dress which sprang up with the progress of democracy resulted in the abandonment of these absurd fashions.

Hair Dyes. The practice of dyeing the hair prevailed among savage races in ancient times, and is still resorted to by those who fancy that they thereby add to their personal attractions or wish to appear younger than they are. Vegetable dyes are commonly used by savages, and are also in favour with the fair sex in China and other Eastern countries; but, with the progress of civilisation, mineral preparations are found more effective. These generally consist of a solution of oxide of silver, mercury, bismuth, lead, or some other metallic salt. Most, if not all, are injurious.

Hair Powder, a scented white powder, which was sprinkled on the wigs and hair-dresses (q.v.) worn in the 18th century. Notwithstanding a law that it should be made exclusively of starch, flour was much employed in its preparation, and in 1746 a large number of hair-dressers were heavily fined for using adulterated powder. A tax imposed in 1795 was at first a fruitful source of revenue, but it led to the disuse of hair powder and was repealed in 1869. Hair powder is still often worn by footmen, and sometimes forms a part of fancy-dress costume.

Hairs (on plants) are modified cells of the epidermis, either on roots, stems, or leaves. Though each hair originates in a single cell, they often become multicellular, assume various forms, and perform several very different functions. The stems of mosses (q.v.) give off root-hairs which branch freely and bear gemmæ. The sporangia of ferns, and perhaps the ovules in such cases of superficial placentation as poppies, are hairs or *trichomes*, as they are termed in general morphology. Hairs generally originate adventitiously, and those

on the roots of flowering-plants are unicellular and exhibit nutatory movements. It is by means of these root-hairs that most flowering-plants take in their liquid food. Hairs occur generally on bud-scales and young stems and leaves, protecting them from radiated cold and perhaps damp, though such structures, as in the hazel and beech, often lose these hairs later, being, as it is termed, *glabrescent*. Hairs are particularly common in certain natural orders, such as the Labiatae and Boraginaceae, and they occur thickly on some plants characteristic of very dry situations and also on water-side plants, but not generally on actual aquatics. Thus it has been suggested that they act as a protection against unwelcome guests in the form of crawling, leaf-eating, or honey-stealing slugs or insects. Those which occur commonly on the outer surface of the calyx do probably perform such a function in addition to the protection of the young flower-bud. Among the chief forms assumed by hairs are the "glandular" or knobbed, which may be unicellular or multicellular, the *moniliform*, or necklace-like, the *peltate* and *stellate*, which, again, may consist of one or more cells, and the *squamose*, or scale-like, as in the chaff-like bodies on the leaf-stalks of many ferns. Hairs often serve as receptacles for certain bye-products of metabolism, such as the sticky substance exuding from those of species of *Lychnis*, *Silene*, *Saxifraga*, etc., or the formic acid of the nettle. The stinging-hairs of the latter are single cells with sharp hooked points, and pressed upon by surrounding epidermal and hypodermal cells. Hairy surfaces are termed *villous* if covered with scattered, long, weak hairs; *silky*, if with more numerous similar hairs, as in the Silver-leaf (*Leucadendron argenteum*) of South Africa; *pubescent*, if with numerous short hairs, as in the sage; or *hispid*, if with stiffer hairs, as in the nettle. Prickles and some bristles differ from hairs in not being exclusively epidermal in origin.

Hair Salt, or EPSOMITE, is the naturally occurring hydrated sulphate of magnesia, which forms the substance commonly known as Epsom salts (q.v.). It has the composition $\text{MgSO}_4 + 7\text{OH}_2$, and occurs as a fibrous efflorescence at Epsom, Seidlitz, etc., and as fine silky fibres (hence the name) at Idria. The name is also sometimes applied to the naturally occurring sulphate of aluminium or *feather alum* $\text{Al}_2(\text{SO}_4)_3 + 18\text{OH}_2$, which occurs in fine fibrous masses in Chili and Bohemia.

Hair-streaks, a small group of five species of butterflies belonging to the *Lycaenidae* (q.v.). The "Green Hair-streak" (*Thecla rubi*), is one of the smallest. The "Brown Hair-streak" (*Zephyrus betulae*) belongs to an allied genus.

Hair-tails (*Trichiurus*), a tropical genus of acanthopterygian fishes with six species, all having the body band-like, and tapering posteriorly without a caudal fin. Some of them attain a length of four feet, and *T. lepturus*, the Common Hair-tail, has occurred on our coasts.

Hajj, or HADJ (Arabic, "pilgrimage"), the pilgrimage to the Kaaba (q.v.) or black stone at Mecca, which every devout Mussulman is expected

to make at least once in his life. After performing this duty, he receives the title of Hajji.

Hake (*Merluccius vulgaris*), an important British food-fish of the Cod family. The elongated body is covered with minute scales, the caudal fin is separate, there are two dorsal fins and one anal, and the large ventrals are composed of seven rays. The general hue is greyish, darker on the back, and the length is from three to four feet. Like cod and ling, hake is dried and salted as stock-fish. The only other species, *M. gayi*, ranges from Chili to Magellan's Straits and New Zealand.

Hakkari, a chief branch of the Kurds [KURDS] who give their name to the mountainous district in the province of Van, Turkish Kurdistan, of which they are the original inhabitants. The Hakkari are turbulent and fanatical Mohammedan nomads, divided into a large number of sub-tribes. It was in the Hakkari country that the Oriental scholar and explorer, M. Schulz, was murdered in 1829, and most of the predatory expeditions against the surrounding Christian communities (Armenians and Nestorians) are conducted by these lawless mountaineers. (W. Ainsworth, *On the Hakkari*, in *Journal of the Royal Geographical Society*, vol. xi.)

Hakluyt, RICHARD, English clergyman and geographical writer, was born in 1553, was for some years chaplain to the English Embassy in Paris, and at the time of his death in 1616 was Archdeacon of Westminster. Between 1582 and 1589 he compiled, in three volumes, his famous collection of voyages. Many editions, some with additions recommended by Hakluyt himself, have since been published. In continuation of his work, the Hakluyt Society "for the publication of rare and valuable voyages, travels, and geographical records" was formed in London in 1846.

Hakluyt Society. [HAKLUYT.]

Hakodate, a port of Japan, situated on a peninsula in the south of the island of Yezo, is built on the slope of a hill 1,200 feet high. Since 1859 the port, which has a fine harbour, has been open to Europeans. The trade is chiefly in seaweed, sulphur, and salted salmon.

Halation. In the photography of objects or landscapes in which very bright parts are present, the high lights may frequently appear blurred and surrounded by a halo. This appearance is known as "halation," and is caused by the reflection, from the back of the glass, of light which has penetrated the film. It is often seen around windows in photographs of interiors, and in the case of dark objects, as tree trunks, branches, etc., standing out upon a bright sky. Halation may be more or less completely prevented by various devices: as (1) *backing* the plate with a black (or yellow) varnish, so that the reflection of light (or actinic light) becomes practically *nil*, and washing away the varnish before development; (2) by the use of thick opaque films; (3) by the use of films supported upon transparent paper, etc., instead of glass. Varieties of plates intended especially to obviate halation are also obtainable in the market.

Halberd, or HALBERT, a weapon which came into general use towards the close of the Middle Ages, and was common in the 15th and 16th centuries. It varied considerably in form, but the ordinary type was a stout wooden handle about six feet long, surmounted by a sharply-pointed blade, with a cross-piece which on one side resembled an axe, and on the other had the curve of a hook.

Halberstadt, a fine old town in Prussian Saxony, 25 miles S.W. of Magdeburg. Its history goes back to the 9th century, when it became an episcopal see; and it received municipal privileges in 998. It suffered much during the 'Thirty Years' War, at the close of which it went to Brandenburg. The cathedral, begun in the 13th and finished in the 14th century, was restored between 1850 and 1871. It is in the Pointed style and has some beautiful coloured glass. The church of Our Lady (12th century), the town-house (14th century) with wine-cellars beneath it, and the Peterhof are also of interest. Gloves, cigars, and machines are made, and railway repairs undertaken.

Haldane, ROBERT (1764-1842), religious writer and preacher, was born in London. After serving three years in the navy, he continued his education at Edinburgh. In 1798 he sold his estate at Airthrey, and, having left the Church of Scotland, soon after set up Congregational tabernacles in Edinburgh. He afterwards adopted Baptist views, and alienated many of his followers. He spent large sums on his religious work, and in 1816-17 preached with great success in Geneva and Montauban. He was the author of two widely-circulated works, *The Authenticity and Inspiration of the Scriptures* and *Exposition of the Epistle to the Romans*. His brother JAMES (1768-1851) was associated with him in his work, and also became known as a controversialist, especially by his attack on the doctrines of Edward Irving.

Hale, EDWARD EVERETT (b. 1822), a voluminous American writer, was born at Boston, Massachusetts, and graduated at Harvard. In 1856 he became minister of the South Congregational (Unitarian) church in Boston. He has given much attention to Spanish-American history, and edited *Original Documents from the State Paper Office and the British Museum illustrating the History of Sir W. Raleigh's first American Colony and the Colony at Jamestown* (1860). Among his stories are *The Man without a Country* (1863) and *The Skeleton in the Closet* (1866).

Hale, SIR MATTHEW (1609-76), a great English judge, was born at Alderly, Gloucestershire. He studied under Noy at Lincoln's Inn, and made the acquaintance of Selden. He was one of Archbishop Laud's counsel when impeached, and is said also to have advised Strafford. He conformed to the Parliamentary government after the war, and about 1654 became a justice of the Common Pleas. He also sat in Parliament for his own county and Oxford University during the same period, and was a member of several committees both before and after the Restoration, in which he took an active part. He supported the Bill of Indemnity, and

made more than one attempt to obtain the "comprehension" of Dissenters within the Church. In 1660 he became Chief Baron of the Exchequer, and in 1671 Lord Chief Justice. As a judge he was renowned for his integrity, his learning, and his patience. There are lives of him by Bishop Burnet and Sir J. Bickerton Williams.

Hales, ALEXANDER OF (d. 1245), one of the most celebrated of the English school-men, known as the *Doctor Irrefragabilis*. His chief work was *Summa Universa Theologie*.

Hales, JOHN (1584-1656), one of the most enlightened thinkers of the 17th century, was born at Bath. At Oxford he became fellow of Merton and University lecturer on Greek, and he also delivered a funeral oration on Sir Thomas Bodley. In 1612 he became fellow of Eton, of which post he was deprived by the Parliament in 1649. He attended the Synod of Dort in 1618, and came back disgusted with theological prejudice. His religious opinions became very liberal, and he was charged with Socinianism. In spite, however, of his tract on *Schism and Schismatics*, Laud made him one of his chaplains and obtained for him a canonry at Windsor. When deprived of his offices under the Commonwealth he lived with great simplicity as a private tutor, and sold his valuable library to a London bookseller. *The Golden Remains of the Ever-memorable Mr. John Hales* first appeared in 1659. His complete works were first collected and edited by Lord Hailes (q.v.).

Hales, STEPHEN (1677-1761), physiologist, was born at Bekesbourne, Kent. He became fellow of Corpus Christi, Cambridge, in 1703, and afterwards held livings in Somersetshire and Hampshire (Farringdon). In 1718 he was elected F.R.S., and received the Copley medal in 1737. He was one of the founders of what was later called the Society of Arts. He lived chiefly at Teddington, of which he was perpetual curate. In 1751 he became chaplain to Prince George (afterward George III.) and clerk of the closet to his mother, who raised a monument to him in Westminster Abbey. Hales's most important work, *Statistical Essays*, deals with botany and physiology, in which he first opened the way to a correct appreciation of blood-pressure. His best-known invention was that of artificial ventilators; but he also contrived machines for distilling sea-water and for the keeping of meat and water during sea-voyages. His pamphlet against brandy-drinking was republished in 1807.

Halévy, JACQUES FRANÇOIS ÉLIAS (1799-1862), a French musical composer of Jewish extraction (his real name was LÉVI) was born at Paris. He studied at the Paris Conservatoire under Cherubini and in 1819 gained the "Grand Prix de Rome," after which he went to Rome. His first operas produced in Paris were not successful, but *Clari* (1828), in which Malibran sang, made him known, though the ballet *Manon Lescaut* was the first of his works which really attracted the public. In 1835, however, in which *La Juive* was given, his name became famous. *L'Éclair*, a musical comedy (1835), showed him to have capacity for lighter music. As a professor at the Conservatoire he had

Gounod and Bizet among his pupils. In 1854 he became secretary of the Académie des Beaux-Arts, and published the *éloges* he had to pronounce there in *Souvenirs et Portraits* (1861).

Halévy, JOSEPH (b. 1827), French traveller and Orientalist, was born at Adrianople. He went through Abyssinia in 1868, and in the two following years collected for the French Academy while travelling in Yemen over 800 Sabæan inscriptions. Besides descriptions of his travels, he has published *Études sur la Syllabaire Cunéiforme* (1876), *Recherches Critiques sur l'Origine de la Civilisation Babylonienne* (1877), and other works on kindred subjects.

Halévy, LUDOVIC (b. 1834), some time secretary to the Corps Législatif, collaborated with Meilhac in the librettos of Offenbach's opera-bouffes. They also wrote in conjunction several comedies such as *Frou-Frou* (1870), *Toto chez Tata* (1873), *Le Mari de la Débutante* (1879), and other light pieces. As a novelist Halévy has written *Madame et Monsieur Cardinal* (1873), *Les Petits Cardinal* (1880), *L'Abbé Constantin* (1882), and *Criquette* (1883). His *L'Invasion* was a description of the Franco-Prussian War. He was admitted to the Académie in 1886.

Half-pay, the salary paid to commissioned officers in the British army and navy while they are not actively employed. In the navy, where it is rather less than two-thirds of full pay, it forms the regular stipend of officers whose ships are no longer in commission until their appointment to a new ship. In the army officers are not placed on half-pay, except in cases of illness or inefficiency, until they have held a command as lieutenant-colonel for four years; they then receive half-pay until they are promoted.

Haliburton, THOMAS CHANDLER (1796-1865), author of *The Clockmaker; or, the Sayings and Doings of Samuel Slick of Slickville* (1837), was born in Nova Scotia. He became a member of the Assembly, and was successively Chief Justice of the Common Pleas and judge of the Supreme Court. In 1842 he retired and came to England. He was a Conservative member of Parliament from 1859 to 1864, and died at Isleworth. Among his works were an *Historical and Statistical Account of Nova Scotia* (1829), *The Old Judge* (1849), and *The Americans at Home* (1854).

Halibut, HOLIBUT (*Hippoglossus vulgaris*), the sole species of its genus, and the largest of the flat-fishes, specimens of between five and six feet long being fairly common; but it is said that fish of more than three times this length have been taken in high latitudes. The general colour is brownish on the upper surface, with markings of a darker shade and white beneath. The halibut is an important food fish, but its flesh is inferior to that of the turbot (q.v.).

Halicarnassus, a Greek city, originally known as Zephyria, and now called Budrun, is in Caria, Asia Minor. It was of Doric origin, and belonged for a time to the Hexapolis confederacy.

It became of importance under Lygdamis, a Persian satrap of Greek birth, in 500 B.C., and reached its greatest glory under Mausolus and Artemisia a century and a half later. It was destroyed by Alexander the Great, but its citadel held out against him. At Halicarnassus Herodotus, the father of history, was born. Interesting excavations have been made on the site of the ancient city during the present century.

Halichondrina, one of the two divisions of the Cornacuspongia, includes those in which the skeleton is composed of spicules, and there is little or no spongin. Its nearest allied group is that of the Keratosa. [SPONGE.]

Halifax. 1. A town in the West Riding of Yorkshire, 43 miles S.W. of York. Its name is variously said to mean "holy ways" and "holy face." The parish church (St. John's), in the Perpendicular Gothic style, was restored in 1879. All Souls' church was designed by Sir Gilbert Scott. There are forty Nonconformist places of worship. The Piece Hall, originally used as a storehouse and place of sale for manufactured goods, is now used as a market hall. The People's Park was laid out from designs by Paxton, and was given to the town by Sir F. Crossley, who, with his brother also in great part, defrayed the cost of building the orphan home and school. It was endowed largely by Mr. J. Porter. Besides its buildings and its water-works, Halifax has a flourishing Co-operative Society known as the Halifax Industrial. The carpet-works, employing more than 5,000 hands, are the largest in the world, and the manufacture of worsted and cotton stuffs is also carried on. The borough returns two members to Parliament.

2. The chief town of Nova Scotia, is situated on the eastern coast of that peninsula. Its harbour, capable of holding the whole British navy, is one of the finest in the world, and was called by the Indians Chebucto, "greatest of havens." The dockyard is also one of the finest in British North America. The graving-dock, which will hold the largest ship afloat, and is the largest in America, was constructed between 1880 and 1889. The history of Halifax does not go back farther than the middle of the 18th century. It was founded in 1749, and called after the English nobleman who had been most zealous in its protection against French projects. It was so strongly fortified as to be deemed impregnable, and soon became the most important naval and military station in British North America. Its commercial importance, however, dates only from the period following the last French war. It is now the eastern terminus of the Canadian Pacific and Inter-Colonial railways, and is an important coaling-station and starting-place for lines of steamers. Its streets are lighted by electricity, and the sanitary arrangements are perfect. The public schools are free, and to some extent compulsory. The Dalhousie University supplies advanced education. Among other educational institutions, Halifax has schools for the blind and the deaf and dumb. Dartmouth is a suburb on the opposite side of the harbour.

Halifax, CHARLES MONTAGUE, EARL OF (1661–1715), an able financier and Whig statesman, was born at Horton, Northants. and educated at Westminster and Trinity College, Cambridge, where he became the friend of Newton. Having made a reputation as a wit by *The Town and Country Mouse*, a parody on *The Hind and Panther*, which he wrote with Prior, he was brought into Parliament for Maldon by Lord Dorset. For his share in the Revolution he was granted a pension by William III., and appointed to a post in the Treasury. Three years later he was made Chancellor of the Exchequer as a reward of his financial services. By taking up Paterson's scheme he laid the foundation of the Bank of England, and in 1695, with the assistance of Newton, he carried out a reform in the coinage. During the years 1697–99 he was First Lord of the Treasury, and attempted to amalgamate the old and new East India Companies. He had made many enemies, however, and was twice accused of breach of trust, but on each occasion acquitted. During the reign of Anne he lived in retirement as auditor of the Exchequer, having also been created a peer. He supported, however, the leading objects of the Whigs, and on the accession of George I. the veteran Whig was made Earl of Halifax and Lord Treasurer. He held office only a few months, and died, having survived his reputation. His claim to have been a friend to men of letters was bitterly denied by Pope, who charged him with "helping to starve" Dryden. His grandson, the third Earl (1716–71), was Secretary of State under Lord Bute, George Grenville, and Lord North, in the reign of George III.

Halifax, GEORGE SAVILE, MARQUIS OF (1633–95), the celebrated "Trimmer," was made a Viscount for his share in bringing about the Restoration. Throughout his career it was his practice to support the principle of steady government and the men of moderation when in danger of being overborne by royal tyranny or popular clamour. Thus in 1675 he opposed the Test Bill, the repeal of which and the Habeas Corpus Act when demanded by James II. he likewise withstood. It was his eloquence which in 1679 procured the rejection of the Exclusion Bill by the House of Lords. From 1682 to 1685 he was Lord Privy Seal, and, though dismissed, was appointed by James II. to treat with William of Orange. That king had equal confidence in him and restored him to his office; but he soon found it necessary to go into opposition. His last notable act was his opposition to any censorship of the press. His *Character of a Trimmer* forms Halifax's apologia.

Halifax, VISCOUNT. [WOOD, SIR CHARLES.]

Haliotidæ, a family of Gastropoda of which *Haliotis* is the type; its popular name is the "Venus' Ear Shell" (q.v.).

Haliphysema, an animal which formed one of the principal members of the problematical group *Gastræadæ*; it is, however, now known to be a Protozoan.

Halitherium, an interesting genus of extinct

Sirenia (q.v.), less specialised than their living allies, the dugongs and manatees. Remains have been found in Miocene and early Pliocene rocks in Suez, Malta, Italy, France, Darmstadt, Germany, Belgium, and the Red Crag of Suffolk. *Halitherium* had tusk-like incisors in the upper jaw, as in the dugongs, but its molars resembled those of the manatees. Unlike both existing genera, it had short, broad nasal bones and a rudimentary thigh bone and socket.

Hall, BASIL, naval officer, explorer, and author, born in 1788, was a son of Sir James Hall, Bart., of Dunglass. He entered the navy in 1802, served as a lieutenant in the *Endymion* in covering the retreat of Sir John Moore's army in 1809, and became a commander in 1814, and a captain in 1817. As a commander in the *Lyra*, 10, he accompanied Lord Amherst's embassy to China, and on his return published *A Voyage to the Western Coasts of Corea*, etc. (1817). He then made a long tour on the Continent and travelled extensively. His experiences are embodied in numerous works, among which may be mentioned *Extracts from a Journal written on the Coasts of Chili, Peru and Mexico* (1823), *Travels in North America* (1828), and *Patchwork* (1841). He died in 1844.

Hall, CHARLES FRANCIS, Arctic explorer, was born of humble parentage in New Hampshire, United States of America, in 1821. After having been in turn blacksmith and journalist, he lived for several years among the Esquimaux and gained so much valuable Arctic experience that in 1871 he was placed by the American Government in charge of an expedition which, in the *Polaris*, set out on an attempt to reach the North Pole. At Polaris Bay, on the Greenland coast, he died in November, 1871. The story of the expedition was published by the United States Government.

Hall, CHRISTOPHER NEWMAN (b. 1816), a Congregationalist preacher and writer, was born at Maidstone. Having graduated with distinction at London University and gained the law fellowship, he preferred entering the ministry to going to the bar. In 1854 he left the Albion Congregational Church for Surrey Chapel, now called Christ Church, Lambeth. Among his devotional works are *The Call of the Master* (1855) and *The Man Christ Jesus*.

Hall, JOSEPH (1574–1656), the satirist, was born at Ashby, Leicestershire, and educated at Emmanuel College, Cambridge. He took orders and became successively incumbent of Halstead and Waltham, Dean of Worcester, and Bishop of Exeter (1627) and Norwich (1641). He went with James I. to Scotland in 1617, and was one of the English deputies at the Synod of Dort, where he preached charity. He was distrusted by Laud and had to complain to the king of the spies set on him by the archbishop. He was imprisoned by the Parliament, and when released was driven out of his palace at Norwich, his last days being passed in poverty at Higham. His satires called *Virgide-miarum* (1597–98) were some of the earliest in the language, and aroused the jealousy of Marston. Besides this he wrote a prose satire (*Mundus alter*

et Idem) in Latin against the Roman Catholics, and published devotional works which are highly praised by Fuller.

Hall, MARSHALL (1790–1857), the author of the accepted method for restoring respiration after apparent drowning, was born at Basford, Notts, being a son of Robert Hall, who first used chlorine for bleaching cotton. Having graduated at Edinburgh and visited the medical schools at Paris, Göttingen, and Berlin, he began to practise as a physician at Nottingham, but left it for London in 1826 and practised there till 1853. He made important discoveries in connection with the reflex action of the spinal system, and published able works on diagnosis, the circulation of the blood, and other medical subjects. His memoirs, with a biography, were written by his widow.

Hall, ROBERT (1764–1831), the Baptist preacher, was born near Leicester. He was educated at the Bristol Academy and at King's College, Aberdeen, and became intimate at the latter place with Sir James Mackintosh. In 1785 he began his ministry at Bristol, where he stopped for five years. In 1791 he came to Cambridge, and increased his reputation as an orator by his sermon on *Modern Infidelity* (1800). For two periods of several months (in 1804–5 and 1805–6) he lost his faculties, and soon after his recovery left Cambridge for Leicester. Here in 1817 he delivered his famous sermon on the death of Princess Charlotte. Besides sermons he published *An Apology for the Freedom of the Press* (1793) and other works.

Hall, or HALLE, EDWARD (d. 1547), the chronicler, was born about 1498 in Shropshire, and was educated at Eton and King's College, Cambridge. He then went to London to enter upon a legal career. He became Common Sergeant in 1532, and was several times reader at Gray's Inn. Some years afterwards he entered Parliament, where, as member for Bridgewater, he supported Crown interests. His *Chronicle*, entitled *The Union of the Noble and Illustre Families of Lancastre and York*, was first printed in 1542, but this edition is very rare. In 1550 a more complete one was issued, and in 1809 a reprint was published by Sir H. Ellis.

Hallam, HENRY (1777–1859), the historian, was born at Windsor and educated at Eton and Christ Church, after which he went to the bar. He did not, however, long continue to practise, but, having obtained a Commissionership of Stamps and having property besides, gave his whole attention to literature. In 1818 he published his *View of the State of Europe during the Middle Ages*, which immediately established his reputation for learning and research. His *Constitutional History of England*, which appeared in 1827, covered the period from the accession of Henry VII. to the death of George III. He had in his former work in some measure dealt with the earlier constitutional history, but his account of this formative period has been superseded by Dr. Stubbs's works. Hallam's book is still the standard authority on Tudor and Stuart

constitutional history. Hallam's last great work, the *Introduction to the Literature of Europe in the 15th, 16th and 17th Centuries* (4 vols. 1837–39), showed the same accuracy and learning as the previous publications, and had the same defect of colour. In spite of an impartiality beyond praise in those *Quarterly* and *Edinburgh* days, he showed decided Whig leanings, though of an historical rather than of a practical character.

ARTHUR HENRY HALLAM, the friend of Tennyson, was born in 1811. He died at Vienna in 1833, when on a Continental tour with his father. Among his *Remains* the best specimens of his work were his *Essay on Cicero*, his attack on Rossetti's symbolic criticisms of Dante, and his review of Tennyson's first poems.

Hallamshire, a manor in the S.W. of Derbyshire, the boundaries of which are now difficult to define. It is thought to have included the parishes of Sheffield and Ecclesfield. A parliamentary division of the West Riding now bears this name.

Halle (Halle an der Saale), a city of Prussian Saxony 20 miles N.W. of Leipzig. It is built upon several islands on the Saale, and is at the junction of several railways. It is a very old town. In the 10th century it belonged to the Archbishop of Magdeburg, in the 13th was one of the leading Hanse Towns, but after a struggle of five centuries again in 1478 it fell under ecclesiastical power. At the Peace of Westphalia Halle went to Brandenburg, and in 1694 Frederick I. of Prussia founded its celebrated university. This was suppressed by Napoleon, but re-established in 1815, when it was incorporated with Wittenberg. It was long a theological stronghold, but at length became a centre of Rationalism. Chief among the buildings of the city are St. Mary's church (16th century) and the Gothic church of St. Maurice, which dates from the 12th; the remains of the Moritzburg, the former residence of the Archbishops of Magdeburg; the University library, the Red Tower (276 ft. high), and Roland statue in the market-place; the Town Hall and the Francke Institution. [FRANCKE.] Halle is celebrated for its salt springs, worked by the "Hallören" from the beginning of the Middle Ages. These men are supposed to be descendants of the original inhabitants, and have peculiar customs and immunities. Machine-making and sugar-refining are the chief industries. At Halle was born Handel the composer.

Hallé, SIR CHARLES (b. 1819), the well-known pianist, was born at Hagen, Westphalia. He studied and established himself in Paris, but after the outbreak of the revolution of 1848 came to England, where he made Manchester his headquarters. He did much to popularise the great masters, and was knighted in 1888. In the same year he married Madame Norman-Néruda, the violinist—born in 1840. She was an organist's daughter, and was brought before the public at a very early age, playing first in London at the age of ten. Her first husband was a Swedish musician named Norman.

Halleck, FITZGREENE (1790-1867), an American poet, was a native of Guildford, Connecticut. He was for some time private secretary to J. J. Astor, who left him a small annuity which enabled him henceforth to lead a retired life. In 1822 he paid a visit to Europe. His chief poems were *Fanny*, a satire, and *Young America* (1865). His *Life and Letters* were edited by James Grant Wilson, who also collected his works.

Halleck, HENRY WAGER (1815-72), an American general, was born at Westernville, New York State, and entered the army in 1839. He served with distinction in the Mexican War, and rendered useful services in organising the new state of California. In 1854 he left the army for a time and became a lawyer, but when the Civil War broke out he was made a major-general and given the command in Missouri. In May, 1862, he captured Corinth, and the next July became commander-in-chief of the Federal army. This post he held till March, 1864, when he became chief of the staff under Grant. His *Elements of War and Military Science*, written after a tour in Europe when he was quite a young man, were for many years a standard text-book of tactics.

Haller, ALBRECHT VON (1708-77), anatomist and poet, was born at Berne. He graduated in 1727 at Leyden, and also studied at Tübingen, London, Paris, and Oxford. After making a reputation for himself by botanical and anatomical research at Berne, he was appointed the first professor in these subjects and medicine at Göttingen in 1736, where he remained till 1753. In his retirement at Berne he continued his scientific labours, and also took part in public affairs and wrote romances. Besides his botanical and anatomical works, he wrote poems which were republished in 1882 and were the first sign of the revival in German literature. His life was written by Blösch and Hirzel (1877), and Frey (1879).

Halley, EDMUND (1656-1742), an English astronomer, was born at Haggerston and educated at St. Paul's school and Queen's College, Oxford. He began his astronomical studies as a schoolboy, and was elected to the Royal Society at the age of 22. He had previously been to St. Helena and made a catalogue of the southern stars. In 1684 he made the acquaintance of Newton, and found that he had been anticipated by him in his discovery of the nature of the centripetal force in the solar system. He formed a close intimacy with Sir Isaac, and defrayed the cost of publication of the *Principia*, besides seeing it through the press. He also made charts of the winds on the tropical seas and of the tides in the English Channel. In 1703 he became professor of astronomy at Oxford, having previously been refused that post owing to his supposed materialistic views. From 1713 to 1721 he was secretary of the Royal Society, and in 1720 became Astronomer Royal. The comet which he observed and whose return he predicted, has perpetuated his name. Besides the discoveries mentioned, Halley made many others, such as those relating to the magnetic variation of the compass

and the acceleration of the moon's motion. His *Tabula Astronomicæ* appeared in 1749.

Halley's Comet. This comet was observed in 1682 by the astronomer Halley, who had powerful reasons for believing that it was the same comet that had appeared previously in the years 1607 and 1531. He inferred that this heavenly body moved in an elliptical orbit round the sun in the same manner as any one of the planets, but with a far larger orbit. His ideas being confirmed by careful calculations, he ventured to predict that the comet would next appear in 1757 or 1758, possibly retardation from unknown causes delaying it till 1759. The mathematician Clairaut investigated the subject in greater detail in 1758, and further predicted that the comet would first reach its nearest position to the sun about the middle of April, 1759, adding that his calculations might be in error about a month either way. The comet actually appeared on Christmas Day, 1758, and was closest to the sun on the 12th March, just a month earlier than the day which Clairaut had calculated to be the most likely. It has since been shown that the magnificent comet appearing B.C. 11 was identical with Halley's. The next return will probably be in 1910. [COMET.]

Halliwell-Phillips, JAMES ORCHARD (1820-89), the Shakespearian scholar, was born in Chelsea. He spent some time at Cambridge, making much use of the college libraries. His industry and learning procured his election as F.R.S. before he was nineteen. Among his numerous antiquarian publications the chief was a *Dictionary of Archaic and Provincial Words, Obsolete Phrases, Proverbs and Ancient Customs* (1846), compiled when still a young man. The great work of his life was, however, his edition of Shakespeare, to which a life was prefixed (1853-65). He afterwards also published *Outlines of the Life of Shakespeare* (7th edit., 1887). To him chiefly was due the purchase of the poet's estate by the Corporation of Stratford and the formation of the Shakespeare Museum. In 1872 he assumed the name of Phillips, his wife's grandfather.

Hall-marks, or PLATE-MARKS, embossed symbols stamped on articles of gold and silver to show the quality of the material. The name is derived from the Hall of the Goldsmiths' Company, to whom the regulation of the process was entrusted. The symbols are the following: (1) The standard mark; this consists of a crown and the figure 22 for English gold of 22 carats, a crown and the figure 18 for gold of 18 carats, etc. (2) The mark of the assay town—a leopard's head for London, an anchor for Birmingham, etc. (3) A mark showing that duty has been paid—the head of the ruling sovereign. (4) The date mark—a letter of the alphabet, which changes each year. (5) The maker's mark—consisting usually of the initials of his Christian name and surname. To these (6) the workman's mark is sometimes added.

Hallowe'en, the 31st of October, the eve of All Hallows' or All Saints' Day. Popular superstition ascribes exceptional power to witches and

fairies at this season. In Scotland it was formerly marked by festivities and divinations graphically described in Burns's *Hallowe'en*.

Haloës are circles of light around the sun or moon, due to the presence of ice-crystals in the air. They are not usually distinguished from coronæ, which, strictly speaking, are smaller circles appearing round the sun or moon when seen through a faint cloud or mist. The formation of haloës is very similar to that of rainbows; it is due to the refraction of light into the ice-crystal, and its reflection from the inner surface back through the crystal at a definite angle to its original path. A spectator placed at a certain position will receive light that comes from a certain set of crystals placed symmetrically with regard to him and the sun or moon. Such crystals will lie in a circle whose centre is in the line between his eye and the source of light, and he therefore sees a circle of light surrounding that source. The angular distance of the circle from the sun or moon will depend upon the arrangement of the ice-crystals. It is about 22° usually, but secondary haloës of 46° and even tertiary of about 90° have been observed. The different refrangibilities of light of different colours causes primary and secondary haloës to be tinged red on the inside, and blue on the outside edges. Tertiary haloës appear to be uncoloured, but no satisfactory reason has yet been assigned for this deficiency. [RAINBOW, MIRAGE.]

Halogens. This term is applied to the four elements, fluorine, chlorine, bromine, and iodine, which together form a natural group in which the physical and chemical properties exhibit a well-marked gradation. Thus the two first elements are gases, chlorine being, however, condensable to a liquid at moderate pressure and cold. Bromine is a liquid under ordinary conditions, while iodine is a solid substance; fluorine has a very pale green colour, chlorine is of a marked yellow green, bromine is dark red, and iodine deep violet. The atomic weight increases similarly thus: F=19, Cl=35.5, Br=80, I=127. With the alkaline metals they form a series of salts resembling ordinary salt—sodium chloride (NaCl), and from this the general term is derived (*hals*, salt; *gennaō*, to produce). In their various chemical reactions, the heat of formation of their compounds, etc., the same gradation as is noticed above is still more strikingly visible, and is what would be predicted from the position of these elements in the arrangement of the elements according to the *Periodic Law* (q.v.)

Haloxylene, or BLECKMAN'S POWDER, is an explosive compound of sawdust freed from resinous matter, with saltpetre, charcoal, and sometimes also yellow prussiate (ferrocyanide) of potash. The substances are mixed, slightly moistened with water, crushed, ground, pressed to a cake, and then grained like gunpowder. The ordinary proportions are: sawdust, 9 parts; charcoal, 3 to 5 parts; saltpetre, 45 parts. The ferrocyanide is added if very quick explosion be desired.

Hals, FRANS (d. 1666), founder of the Dutch school of *genre*-painting, was born between 1580

or 1584, probably at Antwerp, but passed most of his life at Haarlem. His private life was not exemplary, and he fell into poverty. He received, however, a pension from the municipality, and was buried in St. Bavon's church. He was a great master of the *technique* of portrait-painting, but his flesh-painting is considered somewhat crude, and his shading rather heavy. Vandyck is said to have visited him and praised him very highly. The chief work of Hals is his group of the Society of Archers in their Hall at Delft. His *Mandoline Player* at Amsterdam is also a good specimen of his portraiture. Among his pupils were Van der Helst, Ostade, Brouwer, and Wouvermans. He is generally known as Hals the Elder to distinguish him from his son (d. 1669) and his brother Dirk Hals (d. 1656.)

Halysites, or the CHAIN CORAL, an extinct genus of corals, very common in the Wenlock limestone and some other Silurian rocks.

Ham, the second son of Noah, is described in the book of Genesis as the ancestor of the Arabians, Egyptians, Ethiopians, and other southern races. The name is Hebrew, and means "to be hot." [HAMITIC RACES.]

Ham means literally the "bend of the leg," but the name is now almost entirely confined to the cured thigh of the hog. The process of curing is as follows: After the meat has been well rubbed with salt, it is placed for some days on a bench or in a covered tub until the brine has disappeared. It is then rubbed a second time, some saltpetre or sugar being now added to the salt, and is afterwards replaced on the bench or in the tub for a week, after which the drying takes place. The smoking is usually carried on in a smoking-house containing two or three storeys. A wood fire is lighted in the lowest storey, and the smoke penetrates through the ceiling to those above in which the hams are hung. This operation lasts for about six weeks, during which the fire is never allowed to go out. The hams smoked in Westphalia are considered the best. An immense number of hams are packed for exportation at Chicago and in the neighbourhood.

Ham, West, a borough—practically a suburb of London, on the Thames, in the county of Essex. The chief industries are ship-building and silk-printing. Many of the inhabitants are employed in the Victoria and Albert Docks. It consists of two parliamentary divisions, each returning one member.

Hamadan, a Persian town, in the province of Irak Ajemi, at the foot of Mount Elwund, 180 miles W.S.W. of Teheran. It is supposed to stand on the site of the ancient Ecbatana, and contains the tomb of the philosopher Avicenna (q.v.). Leather is manufactured, and it is the centre of the carrying trade between Teheran and Ispahan on the east and Bagdad and Erivan on the west.

Hamadryad [NYMPH]. Hamadryad is also used as a popular name for *Cynocephalus hamadryas* [BABOON], and for the cannibal snake,

Ophiophagus elaps, of the same family as the cobra, which it exceeds in size.

Hamama (HAMEMA), a powerful Arabo-Berber people of Tunisia, dominant in the southern districts along the northern shores of the Shotts Jerid and Gharsa between the Gulf of Cebes and the Algerian frontier, and extending beyond the Gafsa oasis northwards to the Freshish territory. Before order was restored by the French occupation (1882), the Hamamas were practically independent of the Bey, and maintained a chronic state of warfare with all their neighbours, their marauding expeditions ranging far into the Algerian Sahara. In those days every Hamama male child was placed on the very day of his birth on the back of a horse, and saluted with the words, "Saddle and bridle and life on Islam," meaning that his inheritance would be a horse and arms with which to earn his bread by plundering his Mohammedan neighbours. At present they find it more profitable to earn their bread by acting as caravan guides, cultivating date plantations, and seeking employment as labourers and porters in Tunis, Bona, and other large towns. (*French Official Reports*, 1886-92.)

Hamann, JOHANN GEORG (1730-1788), German man of letters, was born at Königsberg, in Prussia. After leading a desultory and wandering life, he obtained a post in the excise at Königsberg in 1767. He died at Münster. The mystical tendency of his writings was opposed to the spirit of the age in which he lived, but he exercised considerable influence over Herder, Jacobi, Richter, and other eminent writers.

Hamburg, a state of the German Empire, comprising an area of 158 square miles, and including the city of Hamburg and the towns of Bergedorf and Cuxhaven. The city of Hamburg stands on the north bank of the Elbe, about 75 miles from its mouth and 177 miles N.W. of Berlin. It was founded by Charlemagne in 808. In 1190 it received an imperial charter, granting it freedom from external jurisdiction and other privileges. It was one of the earliest members of the Hanseatic League (q.v.), and from the middle of the 13th century onwards rose rapidly in commercial importance. It was very active in suppressing piracy in the North Sea. In 1402 a great battle took place off Heligoland, in which the robber chieftain Stortebeker was defeated by Simon of Utrecht, a Hamburg alderman, whose grave, adorned with symbolical sculpture, remains outside St. Nicholas' church. Stortebeker's goblet, a yard and a half high, is also preserved among the local antiquities. In 1510 Hamburg became an imperial town. During the 16th century it showed a disposition to break loose from the traditional policy of the League, which was ill adapted to the altered conditions of the age. In 1567 it concluded an independent treaty with the English Merchant Adventurers, which, in spite of the opposition of the League and the Emperor, conduced greatly to the prosperity of the town. It was one of the three cities which continued to represent the League after the Thirty Years' War, although they had

now lost most of their ancient privileges. The progress of Hamburg continued with little interruption until the early years of the 19th century. From 1806 to 1814 it was occupied by Napoleon's general Davoût, who was besieged here by the Russians in 1814. Its trade, which had greatly declined during the French occupation, began to revive in 1815, when it joined the German Confederation. In 1842 a great part of the city was destroyed by fire. In 1888 Hamburg was compelled to join the German Zollverein, thereby losing its privileges as a free port. The part of the town which was rebuilt after the great fire contains many handsome houses, but the old town is composed of narrow and irregular streets, intersected by numerous waterways, which afford communication with the Elbe and its tributary the Alster. The ramparts enclosing the town are now laid out as public gardens and walks. Of the ancient buildings which survived the fire the most noteworthy is the church of St. Catherine, built in the 14th century. The other public buildings include the churches of St. Nicholas (designed by Sir Gilbert Scott) and St. Michael, both remarkable for their lofty spires, the town-house, the "school-house" (comprising a large library and a natural history museum), the exchange, and the picture gallery. There is also an important school of navigation, to which an observatory is attached. The industries include sugar-refining, cigar-making, spirit-distilling, brewing, engineering, and ship-building. The importance of Hamburg is, however, almost entirely derived from its position as a great commercial centre. The dock accommodation at Cuxhaven has recently been improved, and, besides the Elbe, several new railways facilitate communication with the interior of Germany. The trade of Hamburg extends to all parts of the world, that with Great Britain being especially active. The chief article of commerce is coffee, next after which rank sugar, wine, spirits, tobacco, butter, hides, leather, and woollen and cotton goods. As a centre for the exchange of money its importance is second to that of London alone. The population is largely composed of Jews. Hamburg has recently gained an evil notoriety as the place of embarkation for destitute aliens—mainly Jewish refugees from Russia and Roumania—bound for Great Britain and the United States. The emigration was, however, greatly checked by the severe outbreak of cholera which visited the town in 1892.

Hamelin, FERDINAND ALPHONSE, French seaman, born in 1796, was the son of a naval officer who distinguished himself during the wars of Napoleon. He for a time commanded the French fleet in the Black Sea in 1854, and in 1855 was made Minister of Marine. He held that appointment, save during two short intervals, till 1860, and, having reached the rank of full admiral, died in 1864.

Hameln, a town of Hanover, on the Weser, 25 miles S.W. of Hanover. It was a member of the Hanseatic League, and was formerly well fortified. Machine-making, brewing, and salmon-fishing are carried on extensively, and leather and

paper are manufactured. Among the many ancient buildings in the town is that shown as the residence of the "Pied Piper" celebrated in Browning's poem, an imposing edifice with heavy mullioned windows and a quaintly-carved gable.

Hamerling, ROBERT (1830-1889), an Austrian poet and man of letters. In 1866 his health broke down, and he passed the remainder of his life at Gratz in a state of physical prostration. His poems include *Sinnen und Minnen* (1860) and other volumes of lyrics, but his best works are his satires, *Ahasuer in Rom* (1866), *Der König von Sion* (1869), and *Homunculus* (1888).

Hamian (HAMEYAN), a large Berber people, province of Oran, Algeria, where they occupy nearly all the territory south of the Shotts between Geryville and the Moroccan frontier. There are two divisions, Hamian-Gharaba and Hamian-Sheraga (West and East Hamian), with numerous *ferkas* (clans), some of whom, after an unsuccessful revolt against the French, withdrew to Morocco in 1881. The Hamians are great traders, and every year equip a caravan of 6,000, 8,000, and even 10,000 camels for the Gurara market in Central Sahara, where corn, cotton goods, crockery, and other European wares are exchanged for ostrich feathers, salt, gold-dust, and (formerly) slaves. There are two other Berber tribes of this name in Oran, one in the Habra basin south of Sidi bel-Abbes, the other (Hamian el Melah) in the Arzen district near the coast.

Hamilcar, surnamed BARCA ("lightning"), a Carthaginian general, is first heard of in 247 B.C., when he was appointed commander of the Carthaginian forces in Sicily. He was then still a young man. At the time of his arrival the Romans had gained possession of the whole island, excepting Drepanum and Lilybæum. Landing unexpectedly on the north coast, he occupied Mount Ercte, near Panormus, and from this centre led numerous expeditions against the Romans, while his fleet laid waste the shores of South Italy. In 244 he suddenly left Ercte, and sailing along the coast, seized the town of Eryx, a point from which he was able to continue his tactics with even better success. Here he remained until the defeat of the Carthaginian fleet under Hanno off the Ægates islands (242) brought the First Punic War to a close. A revolt of the mercenary troops under Spendius and Katho, assisted by the native Africans, which broke out in 241, was finally quelled by Hamilcar in 238. At home he allied himself with the Democratic party, as a counterweight to the intrigues of his aristocratic opponents, led by Hanno. Sent to Spain in 236, he formed the design of founding a Punic dominion in that country, which might serve as a basis for future operations against Rome. Little is known concerning his movements in Spain, but the distance to which he carried his arms may be judged from the fact that he perished in a combat with the Vettones, who inhabited the region between the Tagus and the Anas (Guadiana).

Hamilton. 1. A town of Lanarkshire, on the Clyde, 10 miles S.E. of Glasgow. It is one of the

five Falkirk parliamentary boroughs. The inhabitants are chiefly engaged in mining. Here is Hamilton Palace, the seat of the Dukes of Hamilton, a portion of which dates from 1594. In the neighbourhood are the remains of the ancient castle of Cadzow.

2. A town in Canada West, on Burlington Bay, at the western extremity of Lake Ontario, 40 miles S.W. of Toronto. Several of the chief railways in Canada converge at this point, and the manufacture of iron implements, sewing-machines, and cotton and woollen goods is carried on extensively. Hamilton is a see of both the Anglican and Roman Catholic Churches.

Hamilton, ALEXANDER (1757-1804), American statesman, was born at Nevis in the West Indies, and received his education at Elizabethtown, New Jersey, and Columbia College, New York. He had hardly reached his 19th year when he published an able series of papers in support of the rights of the American colonists. When the war with the mother country broke out, he received a commission as captain of artillery, and in 1777 was selected by Washington as his aide-de-camp. After the close of the war he practised as a lawyer in New York. He represented the state of New York in the Congress of 1782, and took a leading part in the proceedings of the Convention at Philadelphia in 1787, in which a final decision was arrived at as to the form to be given to the constitution. In accordance with a scheme formed by Hamilton a series of essays in support of the constitution, which afterwards became widely known as *The Federalist*, was published in the New York *Daily Advertiser*. More than half the essays were written by Hamilton himself. In 1789 he became secretary of the Treasury in the new Federal Government under Washington. This post he resigned in 1795, after completely restoring the public credit by his skill as a financier. He still remained the virtual head of the Federal party, and was invariably consulted whenever a difficulty arose. In 1799 he succeeded Washington as commander-in-chief of the United States army. He was killed in a duel by his political rival, Aaron Burr.

Hamilton, SIR CHARLES, BART., elder brother of Sir Edward Hamilton, Bart., was born in 1767 and entered the navy in 1776. He shared in Cornwallis's action in 1780, and in the operations by Nelson off Calvi in 1794. In 1799 he was second in command of the expedition to the Helder, and in 1800, as commodore on the coast of Africa, captured Goree. He became a rear-admiral in 1810, a vice-admiral in 1814, and an admiral in 1830. From 1810 to 1814 he was commander-in-chief in the Thames, and from 1818 to 1824 governor and commander-in-chief at Newfoundland. He died in 1849.

Hamilton, SIR EDWARD, BART., British naval commander, was a son of Captain Sir John Hamilton, R.N., and was born in 1772. In command of the *Surprise*, 32, he took or destroyed above 80 vessels, but it was in 1799 that he gained his greatest fame by cutting out with his boats from under the fire of nearly 200 guns in the batteries

at Puerto Cabello, the Spanish (formerly British) *Hermione*, 44. Hamilton, who was severely wounded, was in due course made a knight, a K.C.B., and a baronet; but, in the meantime, he had been captured by the French, and had been dismissed the service for ill-treatment of his men. He was, however, exchanged and restored, and died in 1851, having been for thirty years a flag-officer.

Hamilton, EMMA, LADY (1763–1815), notorious through her connection with Lord Nelson, is said to have been the daughter of a labourer named Lyon and to have been born in Cheshire. In 1791 she was married to Sir William Hamilton, the English ambassador at Naples, and it was during her residence at that court that Nelson made her acquaintance. Their daughter, Horatia, was born in 1801. Lady Hamilton died, in extreme poverty, at Calais.

Hamilton, PATRICK (d. 1528), a Scotch divine, was probably born towards the close of the 15th century. After studying at the universities of Paris and Louvain, where he imbibed the doctrines of the Reformation, he proceeded in 1523 to that of St. Andrews, but his Lutheran tendencies became suspected, and in 1527 he sought refuge on the Continent. He now visited Wittenberg, where he formed friendships with Luther and Melancthon. Soon after his return to Scotland he was summoned before Archbishop Beaton at St. Andrews, charged with heresy, and burnt at the stake on the very day of his trial. During his short life he had done much to extend the doctrines of the Reformation in Scotland.

Hamilton, SIR WILLIAM, BART. (1788–1856), a Scotch philosopher, was the son of Dr. William Hamilton, professor of medicine in the university of Glasgow. He was educated at the grammar school and university of his native town, whence he proceeded to Balliol College, Oxford, in 1807. He was appointed professor of civil history at Edinburgh in 1821, and professor of logic and metaphysics in 1836. Meanwhile he had formed a connection with the *Edinburgh Review*, in which appeared his essays on *Cousin* (1829), *Logic* (1833), and *Idealism* (1839). His edition of Reid's works was published in 1846, and in 1854 appeared the first volume of his edition of *Dugald Stewart*, which was never completed. His lectures were published after his death, in 1859–61. His power of acquiring knowledge was extraordinary and his acquaintance with philosophical literature has probably never been approached. But much of his knowledge remained unsystematised and serious inconsistencies have been detected in his doctrine, which was severely handled by J. S. Mill in his *Examination of Sir William Hamilton's Philosophy* (1865).

Hamilton's metaphysical views were in the main those of the Common Sense school of Reid and Stewart, modified to some extent by the doctrines of Kant. In opposition to the Representative theory of Reid, he brought forward his own doctrine of "Natural Realism," maintaining that our notions of an external world are immediately derived from acts of sensible perception. Beyond these

reason cannot go, so that it is impossible to prove the existence of a material world, apart from our own consciousness. All our knowledge is based on the necessity and universality of our elementary feelings and beliefs. Necessity is due either to a power or to an impotency of the mind. Our belief in existence and the intuitions of time and space are examples of the former kind. But other beliefs must be explained by the "Law of the Conditioned." Thus unlimited space and a limit to space are alike impossible conceptions, so that we are compelled to think of each object in space as limited itself, but surrounded by other objects. So, too, with regard to causation—every phenomenon must have a cause, but this cause must be itself conditioned, and to carry on the process from cause to cause would result in an infinite regress of thought. On the law of the conditioned, as applied to causation, Hamilton based our consciousness of the freedom of the will, which he regarded as the sole evidence of the existence of God. While explaining it as a direct act of consciousness, he at the same time follows Kant in making it a postulate of the practical reason.

Hamilton, SIR WILLIAM ROWAN (1805–65), Astronomer-royal for Ireland, was born in Dublin. In 1827 he became keeper of the Dublin Observatory and professor of astronomy in the university. In the following year appeared his *Theory of Systems of Rays*, in a subsequent edition of which (1833) he announced his discovery of conical refraction, based on purely theoretic arguments, but afterwards confirmed by experiment. He also published *A General Method of Dynamics* (1834), *Lectures on Quaternions* (1853), etc. Apart from his mathematical attainments, he was a poet and a linguist of some eminence.

Hamites. [HAMITIC RACE.]

Hamitic Languages, a group of languages forming a distinct and independent linguistic family, current from the remotest times throughout the whole of the Hamite domain [HAMITIC RACE] except Egypt, where it has been replaced by Arabic since the Mohammedan invasion. There are three recognised branches: (1) OLD EGYPTIAN of the hieroglyphic inscriptions and Demotic writing, still partly represented by the Neo-Egyptian or Coptic, which, though no longer spoken, is still the liturgical language of the Coptic Christians; (2) BERBER, of which there are three main groups; *Kabyle* of Algeria; *Shluh* of Morocco, and *Tamashek* (Tuareg) of the Central and Western Sahara; (3) The so-called ETHIOPIAN, which is spoken with great dialectic diversity throughout Galla, Kaffa, and Somali Lands; amongst the Agau and other primitive peoples of Abyssinia, and by the Afars (Danakil) and Bejas of the coast lands from the strait of Bab-el-Mandeb to Upper Egypt. Aberrant members of this family are also probably the language of the Masia people west of Mounts Kenia and Kilimanjaro, and the speech of the Tibu highlanders of Central Sahara and other allied tribes in Kanem, Bornu, Ennedi, and Baele round about Lake Chad.

Hamitic belongs to the inflecting or highest order

of speech, and its affinities appear to be with the Semitic, from which it separated at such a remote epoch that it is now difficult to establish the relationship. The resemblance is rather in the identity of a common morphological base than in the coincidence of fully developed grammatical forms. The pronominal systems are certainly alike both in their roots and in the process of plural formation; internal vowel change is also a common feature, though much more highly developed in the Semitic than in the Hamitic group; both attach the pronominal elements in the same way to the persons in verbal inflexion, and both employ the same letter *t* to mark the feminine gender in the noun and verb. In Berber this element is even prefixed as well as suffixed, as in *akli*, negro; and *taklit*, negress.

Egyptian has been cultivated longer than any other language, and the early hieroglyphic inscriptions are the oldest specimens of writing in the world. The Berber language also was reduced to written form at a very early date [BERBER]; but none of the Ethiopian languages were ever cultivated by the nations themselves; hence their only written documents are the translations of the Bible made in recent years by the missionaries. For details see under the several headings.

Hamitic Race, one of the main divisions of the Caucasian family of mankind [CAUCASIC], whose original domain was, and still largely is, the whole of North Africa, from the Negro range northwards to the Mediterranean, and from the Red Sea westwards to the Atlantic. Under the purely conventional expression "Hamites" are thus comprised all the non-Negro primitive populations of North Africa, whose unity, however, as in the case of the Aryans, depends far more on linguistic than on physical uniformity. Nevertheless, as there was undoubtedly a primitive Aryan physical type, which may still be studied in those regions where the race has been least affected by foreign elements, so there was also a primitive Hamite type, which appears to be best preserved in some of the more inaccessible uplands of Mauritania (the Great Atlas) and of South Ethiopia (Galla and Kaffa Lands). But elsewhere the integrity of the race has been greatly modified by interminglings especially with the Semites from Arabia in the extreme east (Abyssinia, Middle and Lower Nile valleys), and in the extreme north (the Mediterranean seaboard), and with the Negroes in the extreme south (Somali and Galla Lands, and all along the Soudanese borderlands). But it is no longer possible accurately to determine the original southern limits of the Hamitic domain, although, judging from the vague and scanty ethnological data preserved in the old writers (Herodotus, Strabo, Ptolemy, Pliny), the Libyans, Gaetulians, Numidians, and Mauritians, would appear to have ranged far less southwards than do their modern representatives, the Berbers and Tuaregs. The widespread nation of the Garamantes, whose empire centuries before the new era covered a great part of North Africa, are spoken of by Ptolemy as "already rather Ethiopians" (ii. 8), that is, as

Negroes rather than Hamites. Yet their chief strongholds, captured by Cornelius Balbus, under Augustus, were Cydamus, the present Ghadames, on the northern verge of the Sahara, and Garama, the "Old Jerma" of Fezzan in South Tripolitana. Consequently Negro, or at least Negroid, peoples must at that time have ranged northwards nearly to the Mediterranean, that is, right across to Sahara, which is at present mainly Hamite territory, where Negroes are found, only as slaves or freedmen imported in recent times from Soudan. In general it may be said that throughout the historic period the Hamites have been steadily enlarging their domain southwards, and driving the Negroes more and more into Soudan, in some parts of which, as, for instance, within the great northern bend of the Niger south of Timbuctu, several pure Hamitic (Tuareg) populations are now settled. The same movement has been in progress in the extreme south-eastern regions, where the Somali and Galla Hamites have already reached the Tana basin and the Lake Samburu district, North Masailand, regions which originally were beyond doubt well within the Negro domain. The Masai people themselves are simply Negroid Hamites, and in the equatorial lake region there are traditions of a great Hamite (Galla) empire (Kitwara), of which the present kingdoms of Uganda, Unyoro, and Karagwe are mere fragments. In still more remote times primordial infiltrations took place, by which the dead mass of Negrodom was leavened by an infusion of Hamitic blood throughout the southern half of the continent from the equator to Kafirland, and from the Indian to the Atlantic Ocean. [BANTU, WA-HUMA.]

The Hamitic type, as observed amongst the Mauritanian Berbers, approaches nearest to the Semitic, and differs in no essential respect from the primitive Aryan. Hence it is that from the anthropologic standpoint all three form nearly so many branches or varieties of an original Caucasian stock. Hence also the view accepted by many sound ethnologists that a Hamitic (Berber) element forms the substratum of the present populations of south-west Europe and parts of the British Isles. Herodotus spoke of the ancestors of the present Bejas between the Nile and the Red Sea as "the finest of men;" all travellers describe the Galla and Somali peoples as of splendid physique, and many of the full-blood Berbers are greatly superior—taller, more muscular and robust, better proportioned, and scarcely darker—than the average south European. The skin is fair in childhood, though it soon bronzes when exposed to the air; the hair is black, straight, and rather abundant; the eyes dark brown; face somewhat shorter, and its oval outline less regular than that of the Arab; nose larger, almost aquiline, and deeply sunk at the root; forehead high and straight; head distinctly dolichocephalic (long and narrow); features altogether regular and moderately orthognathous. The Hamite is fairly intelligent, superior perhaps in this respect to the Arab, he is less fanatical and narrow-minded, equally brave, and fond of personal freedom; imbued with the democratic spirit

substituting the commune for the Arab sheikh; by nature sedentary and agricultural, but in steppe lands necessarily pastoral and nomadic.

There are three main divisions: (1) the *Berbers* or *Western Hamites*, along the Mediterranean seaboard from the Siwah oasis near the Nile delta to Morocco, and throughout Central and Western Sahara, but nearly everywhere intermingled with Arabs, and in many places Arabised; (2) The *Ethiopians* or *Eastern Hamites*, mainly from about the equator to Upper Egypt, and from the coast inland to the Nile, but broken by an intruding wedge of Himyaritic Semites (South Arabians) in Abyssinia; (3) the *Egyptians* (Copts and Fellahin) all now assimilated in speech to the Arabs. For details see under the several headings.

Hamlet, the hero of Shakespeare's tragedy, was an early Prince of Denmark, whose story is related in the *Historia Danica* of Saxo Grammaticus (about 1180–1208). The leading incidents of Shakespeare's play occur in the original narrative, but, according to Saxo, Hamlet returned to England after his revenge, married two wives, became King of Denmark, and was ultimately slain in battle. Shakespeare probably derived the tale from the prose *Hystorie of Hamblet*, translated from the *Histoires Tragiques* of Belleforest, who followed Saxo. He may also have made use of an earlier play on the same subject, which is known to have existed as early as 1589.

Hamm, a Prussian town in Westphalia, on the Lippe, 25 miles N.E. of Dortmund. The iron-foundries and wire-works give employment to a large number of the inhabitants.

Hammer is a well-known tool for supplying an impulsive force. The ordinary hammer consists of a head of steel mounted on a handle of beech or ash. The length of handle depends upon the amount of momentum required to be given up during impact. If the hammer-head is too heavy to be wielded by hand, other motive-power may be supplied, such as steam-pressure or head of water. In many mines ore is crushed by heavy cylindrical vertical rods that are lifted by water-power supplied through a water-wheel and allowed to fall on the ore placed beneath. This is the principle of the *shingling* and *tilt* hammers used in iron works. The ordinary steam hammer (q.v.) has a vertical steam cylinder, the piston of which is forced upwards by steam-pressure and so lifts a heavy block of metal. This may be dropped on to the mass of metal placed on an anvil beneath, to be wrought into shape by repeated blows of the hammer.

Hammer-head, any shark of the genus *Zygæna* with five species widely distributed, but most abundant in tropical and sub-tropical seas. The popular name is due to the fact that the front part of the head is produced so as to form a lobe on each side projecting far beyond the width of the body, and at the extremities of these lobes are the eyes. *Z. malleus*, sometimes called the Balance-fish, the best-known species, is bluish-grey above, lighter beneath. Specimens of over 13 feet long have been taken off our coast.

Hammersmith, a parliamentary borough of Middlesex, on the north side of the Thames, now forming part of London. A new suspension bridge (1887) has taken the place of the old one erected in 1827.

Hammond, HENRY (1605–1660), an English divine, was educated at Magdalen College, Oxford, of which he was elected a fellow in 1625. He became rector of Penshurst, Kent, in 1633, and Archdeacon of Chichester in 1643. In 1645 he was appointed chaplain to Charles I., whom he attended in the Isle of Wight. His chief work was his *Paraphrase of Annotations on the New Testament* (1653).

Hampden, JOHN (1594–1643), a renowned English patriot, was descended from an ancient Buckinghamshire family. His mother was the sister of Oliver Cromwell's father. He was educated at Magdalen College, Oxford, and studied law at the Inner Temple. In 1621 he was returned to Parliament as member for Grampound. In the early Parliaments of Charles I., in which he represented Wendover—he associated himself with Eliot, Pym, and the other members who withstood the king's attempts to rule as an autocrat. In 1627 he was imprisoned for a short time for refusing to contribute to a forced loan. When Charles proceeded in 1637 to levy ship-money from inland as well as maritime towns, Hampden refused to pay the tax. He was summoned before the Court of Exchequer, and seven out of the twelve judges declared against him; but his determined attitude had already done much to encourage the opposition to the king's demands. Hampden sat in the Short Parliament of 1640, was returned to the Long Parliament as member for the county of Buckingham, and took a leading part in Strafford's impeachment. He was one of the five members whom Charles attempted to seize in the House in January, 1642. When the Civil War broke out he was placed in command of a regiment, which he had himself raised, in the army of the Earl of Essex. After distinguishing himself at Edgehill and elsewhere, he was slain in a skirmish with a troop of horse under Prince Rupert at Chalgrove Field near Thame in June, 1643.

Hampden, RENN DICKSON (1793–1868), divine, was born in Barbadoes. After a distinguished career at Oxford, he was elected fellow of Oriel College in 1814. His Bampton lectures on the *Scholastic Philosophy Considered in its Relation to Christian Theology* (1832) exposed him to an attack led by members of both the High and Low Church parties. In spite of votes of censure passed in Convocation he was appointed principal of St. Mary Hall (1833). Whyte's Professor of Moral Philosophy (1834), and Regius Professor of Divinity (1836). The controversy was still raging when, in 1847, he became Bishop of Hereford. He published *Observations on Religious Dissent* (1834), and other works.

Hampshire, or HANTS. properly SOUTHAMPTONSHIRE, an English county, bounded on the N. by Berkshire, on the E. by Surrey and Sussex, on

the W. by Wiltshire and Dorsetshire, and on the S. by the English Channel. The area, including that of the Isle of Wight, is 1,070,216 acres. The Southampton Water, an inlet of the Channel, seven miles in length, runs in a north-westerly direction almost to the Wiltshire border, dividing the county into two parts. The larger division—the north-eastern—contains the ridges of the North and South Downs; the south-western is almost entirely covered by the New Forest. There are also extensive tracts of woodland in the east and south-east, forming parts of the ancient forests of Bere, Woolmer, and Waltham Chase. The chief rivers are the Itchen, and the Anton or Test, flowing into the Southampton Water, and the Avon, near the Dorsetshire border, which joins the Stour a little below Christchurch, and falls into the Channel. The climate is mild, especially in the Isle of Wight. Hampshire is mainly an agricultural county; the chief cereal is wheat; hops are also grown, and the bacon cured here is considered the best in England. The manufactures are insignificant, but the county derives some commercial importance from the excellent harbourage afforded by its seaboard, and the roadstead of Spithead, opposite Portsmouth, is one of the stations of her Majesty's fleet. Southampton and Portsmouth, the leading ports, are also the chief centres of trade. There are five parliamentary divisions, exclusive of the Isle of Wight—the North or Basingstoke, the East or Petersfield, the West or Andover, and the New Forest. The parliamentary boroughs are Winchester, Portsmouth, Southampton, and Christchurch. Among the ancient buildings may be mentioned those at Winchester (q.v.), Porchester Castle, near Portsmouth, Hurst and Carisbrooke Castles, and Netley and Beaulieu Abbeys.

Hampstead, a parliamentary borough of Middlesex, four miles N.N.W. of London. The village, once noted for its medicinal springs and now considered the healthiest place near London, is pleasantly situated on high ground and is skirted by the Heath, from which a fine view may be obtained over the neighbouring part of Middlesex. The Kit Cat Club (q.v.) held its meetings at a house on the Heath which is still standing. Hampstead has been the residence of Keats, Leigh Hunt, and other men of letters.

Hampton, a village in Middlesex, on the Thames, 15 miles S.W. of London. At about a mile's distance is HAMPTON COURT PALACE, originally built by Cardinal Wolsey, who presented it to Henry VIII. in 1525. Considerable additions and alterations were made in the reign of William III. under the direction of Sir Christopher Wren, and the Dutch gardens, with their formal terraces and arcades, and the well-known labyrinths, belong to the same period. There is some good tapestry, and the works in the picture-gallery include Lely's *Beauties of the Court of Charles II.* and a portrait by Holbein. It ceased to be a royal palace in the reign of George II., and is now occupied chiefly by persons of rank or good position in straitened circumstances. The buildings were much injured by fire in November, 1886.

Hampton Roads, BATTLE OF, one of the most important naval actions of the American War of Secession. On March 8th, 1862, the Confederate ironclad ram *Merrimac* approached the Federal wooden fleet that lay in Hampton Roads, and, continuing to draw near in spite of a heavy fire, rammed and sank the *Cumberland*, caused the *Congress* to strike, and created general alarm, as she appeared, on account of her armour, to be invulnerable. Next day, however, when she was preparing to renew her onslaught, she was checked and driven off by the opportune arrival of Ericsson's ironclad turret-ship the *Monitor*. It was the first battle between ironclads, and it revolutionised naval warfare.

Hamran (HOMRAN), an Arab people of East Soudan in the Upper Atbara valley, north-west frontier of Abyssinia. They have a few permanent settlements along the river banks, where they cultivate a little land, but most of them are nomads and daring hunters, pursuing the elephant, lion, and rhinoceros armed only with the sword. Many, however, are now supplied with rifles and employed by the German animal-traders to capture the large animals with which they furnish the European zoological gardens and menageries. Sir S. Baker and all other travellers who have visited them speak highly of their courage, trustworthiness, and loyalty. (Myers, *With the Hamran Arabs*, 1876; F. L. James, *Wild Tribes of the Soudan*, 1883.)

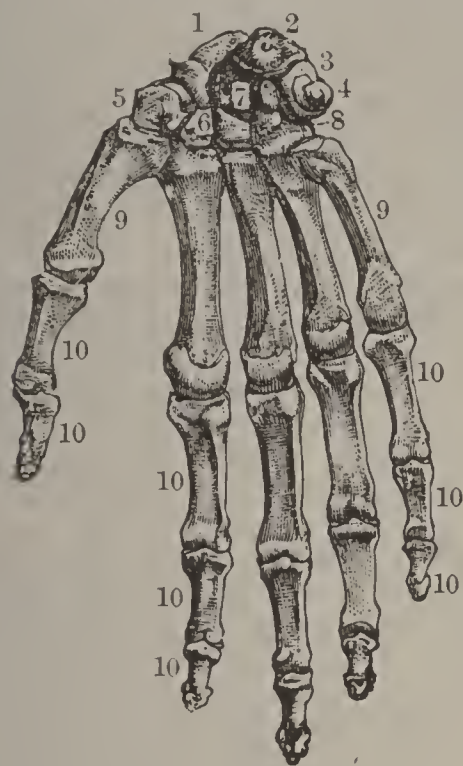
Hamster, any of the nine species of the genus *Cricetus* of the family Muridæ, from the Palæarctic region and Egypt. The body is stout, the limbs and tail short, and there are large cheek-pouches. The Common Hamster (*C. frumentarius*) ranges from the Rhine to Siberia, and southward to the Obi. The length, including the tail, is about a foot, and the fur, which is of some commercial value, is yellowish-brown above, and black beneath. These animals feed on grain, fruit, roots, insects, worms, and frogs, and lay up in their chambered burrows a store of corn as provision for the period after their winter sleep.

Hanau, a Prussian town in the province of Hesse-Nassau, on the Kinzig, 13 miles E. of Frankfurt. The manufactures include hats, carpets, leather, chocolate, and gunpowder, and there are breweries and an iron foundry. In the neighbourhood is the spot where the allied forces under Wiede were defeated by Napoleon in 1813.

Hancock, WINFIELD SCOTT (1824–1886), American general, was born in Pennsylvania. After serving in the Mexican and other campaigns, he joined the army of the Potomac under McClellan on the outbreak of the Civil War, and distinguished himself in the battle of Fredericksburg (1862). At Gettysburg, where he commanded the second army corps, he received a wound which disabled him for a time, but he again led the same division in the Wilderness campaign of May and June, 1864. In 1880 he was nominated Democratic candidate for the Presidency, but was unsuccessful.

Hand. The bones of the hand may be divided into three groups, viz. *carpus*, *metacarpus*, and *phalanges*. The bones of the carpus are eight in

number, and may be divided into two groups containing four each. The first group consists of three bones, the *scaphoid*, *semi-lunar*, and *cuneiform* bones, which articulate with the radius and ulna, forming the wrist joint; and of a small additional bone on the outer side of the wrist called the *pisiform* bone. The second group consists of the remaining four bones (*trapezium*, *trapezoid*, *os magnum*, and *unciform*), which articulate with the first-named group of carpal bones on the one hand, and with the metacarpal bones on the other. The



BONES OF THE HAND.

- 1 Scaphoid. 2 Semi-lunar. 3 Cuneiform. 4 Pisiform.
5 Trapezium. 6 Trapezoid. 7 Os magnum. 8 Unciform. 9 Metacarpal bones. 10 Phalanges.

metacarpal bones are five in number, one for the thumb and one for each of the four digits; and in front of these are the phalanges, numbering fourteen bones in all, two for the thumb and three for each of the fingers. The bones of the hand are united to one another by ligaments. The chief movements of the hand are those of flexion and extension, and pronation and supination—pronation being the position in which the palm of the hand faces downwards, and supination that in which the back of the hand faces downwards with the palm upwards. Beneath the skin of the palm is a resistant fascia which serves to protect the underlying structures, and is known as the *palmar fascia*.

Hand Cameras are small compact varieties of cameras which are intended to be held in the hand during the taking of the photograph. They are therefore chiefly adapted for short or "instantaneous" exposures. In the majority of instruments there is no arrangement for "focussing," as a short focus lens is employed and so fixed that all objects beyond about five yards will be practically in focus. Most are adapted for taking photographs of quarter-plate size, and are supplied with arrangements by which a number of plates can be held and photographs successively taken without the necessity of opening the camera to change the

plates. Some are fitted with continuous "films" (q.v.), so that 50 or more pictures can be obtained before changing. They are therefore very useful for touring purposes, where the weight of the ordinary form is objectionable, and for photography in places where the setting up of a tripod stand, etc., would be an impossibility. The hand- or detective-camera has within recent years become extremely popular, and to meet the growing demand very large numbers of different forms exist in the market, differing chiefly only in their constructive details.

Handel, GEORGE FREDERICK (1685–1759), English musician, was born at Halle in Saxony on February 23rd, 1685. His real name was Georg Friedrich Händel. His father, who was a surgeon, at first discouraged his taste for music, but the boy's genius was too strong to be repressed, and, when he was seven or eight years old, his education was entrusted to Zachau, the Halle organist. At the age of nine he had already begun to compose, and could play the organ, violin, and other instruments. In or about 1696 he was sent to the court of Berlin, where his performances attracted the notice of the Elector of Brandenburg. His musical studies were continued after his father's death (1697), and in 1703 he proceeded to Hamburg, where he played second violin in the opera orchestra. His first *Passion*, produced in 1704, was followed in January, 1705, by *Almira*, his first opera. The years 1706–10 were passed in Italy, where he visited Florence, Rome, Naples, and Venice, performing everywhere with marked success, and composing *Rodriigo* (1709) and other operas. After a short stay in Hanover he came over to England in 1710, and in the following year his *Rinaldo* was produced at the Queen's theatre, Haymarket. He was recalled to his duties as *kapellmeister* at Hanover, but in 1712 he returned to England, which henceforward became his adopted home. By 1715 his services to English music had become so marked that he was granted a pension of £200, subsequently increased to £600. In 1720 the Royal Academy of Music was established at the Haymarket, and placed under Handel's management. This enterprise came to a close in 1726, but in 1729 the theatre was taken by Handel and Heidegger, and the performances were continued. The high position taken by Handel roused the jealousy of Buononcini and other Italian composers. He himself took little pains to conciliate his opponents, and a rival company was started, under the patronage of "the nobility," which, in 1734, succeeded in ousting him from the King's theatre. Subsequent ventures at Lincoln's Inn and Covent Garden both ended in failure, and Handel's financial losses so preyed on his mind that his health gave way, and even his mind was temporarily affected. His mental and physical vigour were re-established by a visit to Aix-la-Chapelle. This catastrophe marks the close of the first period of Handel's career. Henceforward he abandoned opera, and devoted himself entirely to the composition of sacred music, the field in which he was to earn lasting renown. His previous

efforts in this direction had been confined to *Esther*, an oratorio composed before 1720, and a few anthems. The year 1739 witnessed the production of *Saul and Israel in Egypt*. The *Messiah* was performed at Dublin in April, 1742, and soon afterwards in London. It was followed by *Samson* (1743), *Judas Maccabeus* (1746), composed in honour of the victory of Culloden, *Joshua*, and *Solomon* (1748). A large part of the wealth acquired by Handel at this period was given by him to the Foundling Hospital. In 1750 he visited the Continent, and soon afterwards composed his last oratorio, *Jephthah*. He now became almost entirely blind, but he continued his Lenten oratorio concerts, and played the organ at the performance of the *Messiah* eight days before his death, which took place on April 14, 1759. He was buried in the Poets' Corner in Westminster Abbey. Handel's outward appearance was not attractive. His manners were boorish and his temper overbearing, but this rough exterior concealed a heart full of benevolence and generous feeling. His reputation is not likely ever to suffer any diminution. It is based on his great oratorios, and especially the *Messiah* and *Israel in Egypt*, and the enthusiasm shown at the Handel Festivals bears testimony to the hold which he still exercises over the English public.

Handicap, for "hand i' cap," *i.e.* "hand in the cap," was the name given to an ancient method of drawing lots; but the term is now applied to games and sports when means of one kind or another are employed to place the competitors as far as possible on the same level. Thus in horse-racing a horse which has been successful in previous contests has to carry a greater weight, and in billiards the inferior player is given a certain number of points "start."

Hanensha, a historical Arabo-Berber people, province of Constantine, Algeria, Upper Mejerda Valley, and about the head waters of the Seybouse. At present reduced to about 10,000, they were formerly very powerful, and in the 16th century the Hanensha Confederacy ruled over most of Constantine and a great part of the neighbouring territory of Tunisia. The Confederacy, which long held out against the Deys of Algeria, was ruled by a member of the Harar family, with the title of Sheikh, whose alliance was sought far and wide and whose residence was the stronghold of Kalaates-Snam, in Tunisia. Originally of pure Berber stock, they have been largely assimilated to the Arabs in speech, appearance, and religion, since the great Hilala invasion of the 11th century. Before that time most of them are said to have adopted the Jewish religion, and many were certainly Christians during the Roman sway. Since the French occupation they have been organised in the three *dwars* (communes) of Hanensha, Zaruria, and Tifesh.

Hang-Chow-Foo, a Chinese town on the Tsien-tang, at the entrance of the Grand Canal, about 110 miles S.W. of Shanghai. It is the capital of the province of Cheli-chiang. Before the Mongol invasion it was the capital of the empire of

Southern China, and is described as a magnificent city by Marco Polo. It is a place of much commercial importance, and contains several splendid temples. Its silk manufactures have long been famous.

Hanging-buttress, a buttress supported on a corbel.

Hanging Gardens. The Hanging Gardens of Babylon, said to have been founded by Semiramis or Nebuchadnezzar, are minutely described by Diodorus and Strabo. According to these authors they consisted of a series of terraces, resting on stone arches, which reached a height of 75 feet, and were arranged in the form of a square covering nearly 4 acres. They were interspersed with fountains, groves, and banqueting-halls, and the water of the Euphrates was conveyed to a reservoir at the summit by means of a screw.

Hang-nests, the American Passerine family Icteridæ, with 24 genera, containing 110 species, chiefly from the tropical parts of the continents. They are small finch-like birds, allied to the starling and weaver-bird (both which see) and most of them build pensile nests, whence their popular name. [BALTIMORE ORIOLE.]

Han-kow, a town in the Chinese province of Hon-pih, situated at the point where the Han joins the Yang-tse, between 600 and 700 miles by river from Shanghai. It is closely contiguous to the towns of Han-yang and Won-chang. It suffered much in the Tae-ping Rebellion (1857), but is now gradually recovering. Metal wares and cotton goods are manufactured; there is a brisk trade in tea, metals, the cotton grown in the neighbourhood. Furs from Thibet, coal, oil, etc., and British imports are transmitted to the interior by means of junks.

Hanley, a parliamentary and municipal borough of Staffordshire, in the midst of the "Potteries," one mile N. of Stoke. China and earthenware are manufactured, and there are coal and iron mines in the neighbourhood.

Hannibal, a famous Carthaginian general, the son of Hamilcar Barca, was born in 247 B.C. He probably took part in his father's Spanish campaigns. After Hamilcar's death (228) he carried on the war in Spain under Hasdrubal, whom he succeeded (220) as commander-in-chief of the Carthaginian forces. In the course of two campaigns he completed his predecessor's design of forming a Punic dominion in Spain as a starting point for a new attack on Rome, and then laid siege to Saguntum, a town friendly to the Romans (219), with the express design of involving them in a quarrel with Carthage. When Saguntum fell (218), the Romans despatched an embassy to Carthage, requiring Hannibal's surrender; the demand was refused, and the second Punic war began. Hannibal at once resolved to lead an army into Italy. Early in 217 he crossed the Ebro with 90,000 foot and 12,000 horse, but of this number he left behind 11,000 in the country north of the Ebro as a means of maintaining his communication with Spain, and frequent desertions induced him to send back 10,000 more

during his march from the Pyrenees to the Rhone. A Gallic force, which endeavoured to check his progress at the Rhone, was easily repelled, but the passage of the Alps, which occupied 15 days, was attended with heavy losses, owing to the difficulty of the route, the attacks of the barbarians, and the severity of the autumn weather. On arriving in Italy his army was reduced to 20,000 foot and 6,000 horse. The first encounter with the Romans took place at the river Ticinus, where the Consul P. Cornelius Scipio was completely defeated. He withdrew to Placentia, and after effecting a junction with the other consul, Ti. Sempronius, again met Hannibal on a spur of the Apennines, east of the Trebia. Here the Roman army was again routed. In the spring of 217 Hannibal continued his march southwards, and passing the consul, C. Flaminius, at Arretium, proceeded towards Perugia. Flaminius followed him, but his army was surprised at a point where the road passed between Lake Trasimene on the south, and a semicircle of hills already occupied by the Carthaginians on the north, and shut in on all sides, was almost completely destroyed. Hannibal now advanced through Umbria and Picenum to the plains of Apulia, where his movements were cautiously watched by the Dictator Q. Fabius Maximus Cunctator. Having failed to draw Fabius into a general engagement by means of a raid into Campania, he took up his winter quarters at Gereonium. In June, 216, his army of 20,000 men encountered that led by the Consuls L. Æmilius Paulus and P. Terentius Varro, which amounted to nearly 90,000, near the town of Cannae on the Aufidus. Fifty thousand Romans are said to have fallen in the battle. After this victory Hannibal was counselled by his lieutenant, Maharbal, to advance immediately on Rome, but he deemed it more prudent to await a general rising of the Italian nations. He was joined by the greater part of South Italy, but the Latin colonies still adhered to Rome, and the Greek cities on the coast were held in check by their Roman garrisons. His admission into Capua, however, gave him a basis of operations in the neighbourhood of Rome. Here he wintered, and the luxury of the place is said to have had an enervating effect on his soldiers. From this time onwards the fortunes of Hannibal began to wane. His intrigues with the democratic party in the Greek cities led to no fruitful result, and, though he gained possession of the town of Tarentum (212), he was unable to reduce the citadel. Hoping to create a diversion in favour of Capua, now besieged by three Roman armies, he marched against Rome in 211, but the army under L. Fulvius Flaccus sufficed to ward off the attack, while the siege of Capua, continued by the other consul, terminated soon afterwards in its surrender. During the succeeding years hostilities were carried on in a desultory fashion, and with varying success, the most important event being the recovery of Tarentum by Q. Fabius in 209. But the defeat and death of Hannibal's brother Hasdrubal at the Metaurus in 207 practically ended the war. Henceforward his sole object was to maintain his position in the peninsula of Bruttium. There he remained until 203, when he was recalled to Carthage to

repel the invasion of Scipio, who defeated him near Zama in 202. After the conclusion of peace (201) Hannibal, now a Carthaginian suffete (or chief magistrate), proceeded to reorganise the government and reform the financial policy of his country, hoping that it might yet be able to renew the struggle, but the adverse party informed the Romans that he was intriguing against them, and on the appearance of a Roman embassy at Carthage he sought refuge with Antiochus, King of Syria, then about to embark on a war with his enemies (193). Antiochus rejected Hannibal's plan for carrying the war into Italy, but entrusted him with the duty of raising a Phœnician fleet, which he commanded at the battle of the Eurymedon (190). When peace was concluded between Rome and Syria, Hannibal, aware that his surrender was included in the Roman terms, fled to the court of Prusias, King of Bithynia, who placed him in command of a fleet with which he defeated Eumenes, King of Pergamus. The Romans, however, sent an embassy demanding his surrender, and Hannibal took poison to avoid falling into their hands. His death is said to have taken place in 183 at Libyssa, a village on the shore of the Black Sea.

Hannington, JAMES (1847-85), missionary bishop, was first sent to Uganda by the Church Missionary Society in 1882. After returning to England on account of his health he was consecrated Bishop of Eastern Equatorial Africa in 1884, and again set out for Uganda in July, 1885, six months after his arrival in Zanzibar. He made his way through Masai Land, but was put to death by order of Mwanga, King of Uganda, in the neighbourhood of the Nile.

Hanno, a Carthaginian navigator of unknown date (perhaps about 570 B.C.), who explored the western coast of Africa to about lat. 10° S. and founded several towns. The *Periplus*, the Greek translation of Hanno's account of the voyage, is extant.

Hanoi, or KACHAO, the chief town in the French colony of Tonquin, is situated on the Sangkoi, about 90 miles from its mouth. Silks and bullion are exported.

Hanover (Ger. *Hannover*). 1. A province in North Germany. The Elbe skirts its N.E. border, and it is bounded by the North Sea on the N., Mecklenburg and Prussian Saxony on the E., Holland on the W., and Westphalia on the S.W. The area is 14,833 square miles. The surface is level, excepting in the south, where the Hartz Mountains rise to a height of over 3,000 feet. The chief rivers are the Elbe, the Weser, and the Ems. In the north there are numerous heaths, of which that of Lüneburg is the largest; this neighbourhood abounds in sheep-walks, and bees are kept in large numbers. Cattle and horses are reared on the heaths and marshes, and on the best land, along the banks of the rivers, corn and other crops are raised. On the coast there are herring and other fisheries. The Hartz district, which is well timbered, abounds in iron, copper, silver, lead, and other mines. Platt Deutsch

or Low German is still the language of the common people, but in the upper ranks of society its place has been taken by the High German dialect.

History. In early times Hanover formed part of the duchy of Saxony, and Brunswick and Lüneburg remained in the hands of Henry the Lion after he had lost his other possessions. The modern electorate originated in 1569, when the territories of Ernst I. were divided between his two sons, the elder, Heinrich, receiving the duchy of Brunswick, the younger, Wilhelm, those of Lüneburg and Celle. This Wilhelm was the ancestor of George I. of England. The state prospered during the reigns of George I. and George II., who dealt mercifully with it in matters of taxation and endeavoured to adapt the foreign policy of England to Hanoverian interests. Hanover was on the side of Maria Theresa during the war of the Austrian Succession (1740-48), but joined Prussia during the Seven Years' War (1756-63). During the wars against the French Republic a Hanoverian contingent maintained by England was included in the army of the allies. In 1803 an army under Mortier, sent by Napoleon, terrified the Hanoverians into submission. In 1807 a part, and in 1810 the remainder of the electorate was incorporated in the new kingdom of Westphalia. At the close of the War of Liberation Hanover became a kingdom (1815), and in 1819 received a new constitution, with two representative chambers. It was revoked in 1833, but restored in 1837, when Ernest Augustus, Duke of Cumberland (1771-1851), succeeded his brother, William IV., female succession being precluded by Hanoverian law. This arbitrary ruler was compelled during the revolutionary movement in 1848 to grant a more liberal constitution. He was succeeded by his son, George V. (1819-78). Hanover aided Austria against Prussia in the war of 1866, and was annexed to the latter after its close. George V. and his son Ernest Augustus (b. 1845), refusing to renounce their claim to the throne, were forced to live outside the country. Part of their sequestered income was used for secret service purposes by the German Government. The well-known "reptile fund" of Prince Bismarck for subsidising the Press was thus kept up. In 1892, however, an arrangement was arrived at with the Duke of Cumberland, by which he recovered much of his property, but bound himself not to take any step hostile to the Emperor or the Prussian State.

2. HANOVER, the chief town of the province of Hanover (q.v.), is situated on the Leine, 112 miles S.S.W. of Hamburg. The old town, consisting of the central and western portions, is irregularly built, and many mediæval houses still line its narrow streets; the modern town has been much improved during the last 50 years, and now presents a very handsome aspect. Among the ancient buildings the most interesting are the Rathhaus (1429), the "market church" (about 1356), and the Schloss Kirche, the church attached to the Schloss or old city palace, which has an altar-piece by Lucas Cranach. The interior of the Schloss itself (1632) is elaborately decorated, and it contains many objects of artistic interest. The public buildings include the magnificent theatre, the

royal library with 170,000 vols., the Kestner Museum with valuable collections of antiquities and engravings, and the polytechnic school, which contains a large collection of mechanical implements. Hanover is now the centre of the railway system of Northern Germany, and locomotive machinery is manufactured very extensively. The other manufactures include gold and silver wares, waxcloths, sugar, chocolate, and tobacco. Brewing, distilling, printing, and bookbinding, are also important industries.

Hansa, or HANSEATIC LEAGUE, a commercial federation of the North German towns, formed in the Middle Ages. Its original aims were to facilitate the transit of goods by checking piracy at sea and the attacks of robbers on land, and to protect the interests of merchants belonging to the various confederate towns in foreign countries. But, as its power grew, it became more ambitious and sought to obtain a monopoly of trade in the Baltic and the German Ocean. The literal meaning of *hansa* is a band of men; it also denoted a tax imposed for some common object, and may have been applied to commercial leagues in either of these senses. The organisation of the Hansa appears to have originated among the German traders at Wisby on the island of Gothland (q.v.). Here there was a common treasure-house, keys of which were placed in the hands of representatives from Wisby, Lübeck, Soest, and Dortmund. From this centre the organisation spread till it included the ports on the south of the Baltic from Denmark to the Gulf of Finland and the inland towns as far south as Cologne. The Hansa first appears definitely under that title about the middle of the 13th century. The power of the Hanse towns greatly increased after their successful struggle with Waldemar, King of Denmark, resulting in the treaty of Stralsund (1370). In this war they were led by Lübeck, which henceforward figures as the chief town of the League. Bruges was the great emporium at which the products of northern and eastern Europe were exchanged for those of the west and south as well as for Eastern spices and perfumes. The men of Cologne had a house in London as early as the middle of the 12th century, but before the close of the 13th it had been absorbed in the general factory of the League, which became known as the Steelyard. In England, as in other countries, the German merchants formed an independent community; they were not subject to the law of the land, but were governed by an alderman and council of their own who enforced a rigid system of discipline. Residents were not allowed to marry, and other precautions were taken to prevent all intercourse with the English and preserve the exclusive privileges of the league intact. There were also depôts at York, Hull, Bristol, and other towns. The League continued to thrive during the 15th century, and tightened its hold on the Baltic shores. But its commercial supremacy was now threatened by the Dutch and the English, and early in the 16th century a combination of adverse circumstances hastened on its decay. Another mark of the times was the

growth of national sentiment which now displayed itself in Denmark and Sweden, very much to the League's disadvantage. The former country formed a commercial alliance with the Netherlands, and a war carried on by the League in the hope of maintaining their privileges, in which Lübeck was very ill supported by the other towns, ended in a Danish victory (1535). The want of union among the cities was partly due to the religious dissensions occasioned by the Reformation and the social strife which accompanied it. This movement injured the League in another way by greatly diminishing the demand for salt herrings and wax tapers. The discovery of a route to Archangel round the North Cape was followed by a commercial treaty between England and Russia (1555). The greater part of Livonia fell into the hands of Ivan the Terrible, and most of the remainder was seized by Sweden and Poland. The ports of the East Baltic were thus lost to the League, and the route to Novgorod was either entirely closed or became extremely difficult. The factory at Antwerp, which had taken the place of Bruges as a commercial centre, was reduced to a state of bankruptcy during the struggle between the Netherlands and Spain. The prosperity of the Steelyard outlived that of most of the other factories, but the Tudor sovereigns gradually transferred their patronage to the Merchant Adventurers, and the Hansa merchants were finally expelled by Elizabeth in 1598. The last blow was given to the League by the 'Thirty Years' War (1618-48). Lübeck, Hamburg, and Bremen, the only cities which remained to the League after this contest, kept on the old title till within recent years; but as their policy of free trade was opposed to the protective system of the German Empire, they have been obliged to renounce their commercial independence.

Hansard, the name of a family of printers celebrated through their connection with the Houses of Parliament. LUKE HANSARD (1752-1828), a native of Norwich, became printer to the House of Commons in 1798. The publication of the parliamentary debates was undertaken by his son, and remained in the hands of the family until 1889. "Hansard" is recognised as the standard authority on the proceedings of both Houses, and is often appealed to by peers and members of Parliament themselves. The public company entitled the Hansard Publishing Union was incorporated in 1889, but was in liquidation in 1892.

Hanumán, HUNOOMÁN, the Indian name of the Entellus (q.v.) and of a monkey-god, said to have assisted Vishnu (in his avatar as Rama) by raising an army of monkeys and bridging the strait between the mainland and Ceylon, by casting rocks into the sea, so as to allow Vishnu to follow his foe into the island.

Hanway, JONAS (1712-1786), an English philanthropist and traveller. Having become connected with a commercial establishment at St. Petersburg, he undertook a journey through Russia and Persia (1743-1750), of which he published an account. He afterwards settled in London, where he founded the Marine Society, the Magdalen

Charity, and other philanthropic institutions. Hanway was the first Englishman to use an umbrella, and had an animated controversy with Dr. Johnson on the subject of tea-drinking.

Hapsburg, or HABSBERG, the imperial house of, took its name from Habsburg (Hawk's Castle) in the south of Swabia. Habsburg is now a small town on the Aar, in the Swiss canton of Aargau, four miles S.W. of Brugg. The castle, the keep of which remains, was built by Werner, Bishop of Strasburg, early in the 11th century. Count Albert III. was made Landgrave of Upper Alsace by the Emperor Frederick I., and the numerous fiefs held by him and his son included the bishoprics of Strasburg, Basel, Constance, and Lausanne. Rudolf II., great-grandson of Albert III., was chosen emperor in 1273, and, after subduing Ottocar II. of Bohemia, became ruler over Austria and Styria. Subsequently the imperial crown became almost a family possession of the Hapsburg line. The house is now represented through the female line by the Emperor of Austria (q.v.).

Harar, an African town in the Galla countries, about 200 miles W.S.W. of Berbera. It is surrounded by a fortified wall with five gates, and contains some stone buildings. The town carries on a trade in coffee, cattle, hides, and dye-stuffs. The district, of which it is the centre, is governed by an independent emir.

Harbours are inlets of the sea, protected either naturally or artificially. A harbour of refuge is simply a protected roadstead into which a vessel may pass at all times to take refuge from storms outside. The need for artificial harbours was felt in the earliest periods of marine enterprise, both for purposes of naval warfare and of commerce. This need was well supplied by the Phœnicians, Carthaginians, and Romans, whose harbours long remained to show the importance they attached to such works. In the Middle Ages Venice and Genoa gave a fresh impetus to the study of the lost art, and since that time other countries with sea-boards have gradually been led to see the importance of possessing safe and commodious ports.

Breakwaters (q.v.) or *moles* (q.v.), suitably placed so as to resist the passage of waves coming in from the open sea, will secure a safe anchorage on their shore side. The entrance to such an anchorage, or to that of any more enclosed harbour, should be so situated that the sides shall not deflect the sea across the entrance. In both cases also it is desirable that any heavy seas that pass into the enclosure shall be allowed the opportunity of wasting themselves on a suitable beach. If the enclosure is walled all round, the incident and reflected waves round the sides may create a dangerous choppy sea in the harbour. There are advantages in having the moles arched; these certainly resist the waves to a less extent, but do not prevent the flow of currents, which when entirely obstructed may cause an immense amount of excavation from one part and deposition of silt and mud in another. It is of great importance that the harbour shall be sufficiently deep, and that it shall not be silted up in the above manner.

Various plans have been adopted to cause a scouring action of outflowing tidal water to keep the basin free from such matter; an instance of such a provision is the large sluicing basin in the Calais harbour. Quays or wharves of different kinds are added to most harbours; they require to be well protected, and are arranged to suit the situation. These and other such requisites of commercial harbours belong to the subject of docks (q.v.).

Harburg, a Prussian town, on the Elbe, five miles S.S.W. of Hamburg. The trade in oils, chemicals, artificial manures, etc., has increased since the deepening of the Elbe.

Harcourt, SIR WILLIAM GEORGE GRANVILL VENABLES VERNON (b. 1827), second son of the Rev. William Vernon Harcourt, was educated at Trinity College, Cambridge, where he graduated with honours in 1851. He practised at the Parliamentary bar, and became Queen's Counsel in 1866. In 1868 he entered Parliament as Liberal member for the city of Oxford. From 1869 to 1887 he was professor of international law at Cambridge. In 1873 he was appointed Solicitor-General, but early in the following year the Liberal Ministry resigned. In 1880 he became Home Secretary under Mr. Gladstone, but, on seeking re-election at Oxford, he was unsuccessful. He obtained a seat at Derby, however, where Mr. Plimsoll retired in his favour, and has since continued to represent that town. He was Chancellor of the Exchequer in the short-lived Gladstonian Ministry of 1886, and again accepted the same post in 1892. His letters on International law to the *Times*, signed "Historicus," were republished, with additions, in 1863.

Hardenberg, KARL AUGUST, PRINCE VON (1750-1822), Prussian statesman, was born in Lüneburg. After residing in London as Hanoverian minister, he transferred his services to Brunswick in 1781. In 1790 he was selected by the Markgraf of Anspach-Baireuth as his prime minister, on the recommendation of Frederick William of Prussia. When these provinces became a part of the latter state in 1791 Hardenberg was appointed a Prussian minister. He superintended the campaign against France in 1793-94, and brought about the treaty of Basle in 1795. In 1803 he acted as foreign minister during the absence of Haugwitz, whom he succeeded in 1804. His policy was at first animated by hostility to Hanover, and he showed no opposition to the schemes of Napoleon till the French troops were marched through Anspach, in defiance of Prussia's neutral position. In 1806 he was removed from office by Napoleon's command, and henceforward showed himself one of his most determined opponents. His efforts to maintain a steady alliance with Russia were frustrated by the Peace of Tilsit (1807), and soon afterwards he was banished from Prussia through Napoleon's influence, but in 1810 he returned to office as Chancellor, and proceeded to carry out his schemes for the re-organisation of Germany. He was compelled to take part in the invasion of Russia, but he afterwards formed alliances with Russia and Austria, and signed the Peace of Paris in 1814. In 1817 he

was appointed president of the Council of State. Although Hardenberg's policy was often feeble and temporising, he certainly took a leading part in laying the foundation of the Prussian dominion.

Hardenig. A piece of steel is rendered extremely hard and brittle by being heated to red heat and suddenly cooled. In the process of tempering, which means the reduction of the metal to a special degree of softness, it is usual to perform the first operation of rendering the steel glass-hard, and then to raise its temperature to a certain lower temperature before cooling suddenly again. This gives it a degree of softness depending upon the temperature to which it is raised during the latter part of the process. [TEMPERING.]

Hardinge, HENRY, VISCOUNT (1785-1856), entered the army in 1798. He served in the Peninsular War, distinguishing himself at the battle of Albuera. After Napoleon's escape from Elba, he was appointed by Wellington commissioner to the Prussian headquarters, and was present with Blücher at Ligny, where he lost his left hand. He was appointed Secretary at War in 1828, and in 1834 became Chief Secretary for Ireland, a post which he again filled from 1841 to 1844. In 1844 he was made Governor-General of India. During the war with the Sikhs which ensued, he served as second in command to General Gough, the commander-in-chief in India, and was rewarded for his services with the title of Viscount and a pension from Parliament and the East India Company. In 1852 he succeeded Wellington as commander-in-chief.

Hardness. Various substances have different degrees of hardness, which do not depend simply upon their density or their chemical composition. Thus two pieces of steel may have exactly the same chemical components, but one may be rendered much harder than the other by being heated to redness and suddenly cooled. Also a piece of gold may be much heavier than a piece of steel of the same volume, and yet may be much softer. A simple method of comparing the hardness of different materials is to determine their powers of scratching others. A set of substances may be obtained in a series, each in its place being able to scratch a mark on all that succeed it, but on none that precede. These may be numbered, and any new material can be readily placed in its true position in the series by trying its scratching power successively on the substances in the set. Though there are sometimes slight differences in the hardness of different faces on the same crystal, hardness affords an easily-applied means of discriminating minerals. It is measured by reference to a scale of ten minerals, numbered in the order of increasing hardness, named after its deviser, Von Mohs, of Freiberg. Pure crystalline specimens are supposed to be taken as types, and some simple substitutes are mentioned in the following table:—

1. Talc. Can be cut with the thumb-nail.
2. Selenite or rock-salt. Can be scratched with the nail.
3. Iceland-spar or pure calcite. About the hardness of copper-wire.
4. Fluor. Can be cut with a knife.
5. Asparagus-stone or pure apatite. Can be scratched by a knife.

6. Adularia, or pure orthoclase-felspar. Can only be scratched by hard steel.
7. Rock-crystal or pure quartz. Scratches glass or a knife.
8. Topaz. Scratches a steel file.
9. Sapphire. Emery is an impure variety.
10. Diamond. Cuts glass.

Each mineral in the scale will scratch the one below it, and hardness is tested either directly with the minerals of the scale or by drawing a steel file with equal pressure over the minerals to be tested and those forming the scale. Intermediate degrees of hardness indicated as 1·5, 2·5, 3·5, etc., can be measured. The scale is an arbitrary one, the difference of hardness between 1 and 2, and between 2 and 3, being far less than that between 8 and 9 and between 9 and 10. In mineralogical works, "hardness" is often abbreviated as H.

Hardouin, JEAN (1646–1729), a learned Jesuit, notorious for his peculiar views regarding the ancient classics. He was born at Quimper in Brittany, and became librarian of the college of Louis le Grand at Paris in 1683. Hardouin held that almost all the writings attributed to classical authors were fabricated by monks in the 13th century, and that the works of art supposed to be ancient are likewise forgeries. He broached a similar theory with regard to Dante's works. He published a valuable edition of Pliny.

Hardwar, a spot on the Ganges, in the North-West Provinces, in lat. 30° N., where a large religious gathering takes place every year towards the end of March.

Hardy, THOMAS (b. 1840), novelist, was born in Dorsetshire. He studied architecture with considerable success, but abandoned it in favour of literature. The scene of his novels, of which *Far from the Madding Crowd* (1874) was the first to give him a wide reputation, is generally laid in the south-western counties. They are remarkable chiefly for their graphic delineation of rustic humour, but are rarely without an undercurrent of tragedy.

Hardy, SIR THOMAS DUFFUS (1804–78), palæographer and antiquarian, was born in Jamaica. He entered the Record Office in the Tower of London in 1819, and in 1861 became deputy keeper. He edited *Close Rolls* (1833), *Patent Rolls* (1835), *The Chronicle of William of Malmesbury* (1840), and *Modus tenendi Parliamenti* (1846), an important contribution to constitutional history, and published a valuable *Catalogue of MSS.* (1858).

Hardy, SIR THOMAS MASTERMAN, BART., whose name is imperishably associated with that of Nelson, was born in 1769 in Somersetshire, and after seeing a considerable amount of service was made a commander in 1797 and a captain in 1798. As a commander, in the *Mutine*, he first attracted Nelson's attention, and he accompanied that hero in the pursuit of Bonaparte to Egypt. The battle of the Nile gained him his post-commission to the *Vanguard*, Nelson's flagship. Nelson took Hardy with him into the *Victory*, which he commanded at Trafalgar. After the victory Hardy took his ship to Gibraltar for a hasty refit, and then brought her home with Nelson's body on board. At Nelson's

funeral Captain Hardy bore the Banner of Emblems. He was at once created a baronet, and next served on the Halifax, Lisbon, and North American stations. During the war of 1812 he was continually engaged, and upon its conclusion was made a K.C.B. After further service as captain of a royal yacht and as commodore in South America, he attained flag-rank in 1825, and died a vice-admiral and Governor of Greenwich Hospital in 1839.

Hare, the popular name of most of the species of the family Leporidae, the chief exceptions being the Rabbit (q.v.) and the Calling Hares or Pikas (Lagomys), which some systematists make a distinct family. In the genus *Lepus* there are four incisor teeth in the upper jaw, though all are not readily seen, for two are rudimentary and placed just behind the functional pair. In the upper jaw there are six molars, and five in the lower jaw, on each side. The ears are long, the inner surface of the cheeks is clothed with short hair; the tail is short and upturned, the upper lip is deeply cleft; there are five digits on the fore limbs, and four on the hinder ones, and the soles are distinctly hairy. The fur is thick, and of some commercial importance, as when felted it is employed in hat-making. The Common Hare (*L. timidus*) is from 24 to 27 inches long, including the short tail, and may weigh from a dozen to twenty pounds. The coloration of the fur—a dull reddish-brown—is distinctly protective. These animals do not burrow, but generally pass the day in their "form"—a depression in the earth or grass, coming out at night to feed on green vegetation. They pair early in the year, and after thirty days the female brings forth her offspring, called "leverets," and there are generally four or five litters in a year. By the Ground Game Act (1880) occupiers of land may kill hares and rabbits found thereon. [COURSING.] This species is distributed over Europe and Western Asia, where it runs into varieties to which some writers give specific rank; it is common in Britain, but in Ireland is replaced by a variety of the smaller Alpine or northern hare (*L. variabilis*), which is also British. Besides this Irish variety, two others are known, a white form from polar, and a "blue" or greyish-brown from alpine, regions. Other species occur in Asia, Africa, and America. The Pikas or Calling Hares (Lagomys), of which there are from ten to twelve species, are much smaller than the true hares. They have complete clavicles, and there is one molar less on each side in the upper jaw. The type-species (*L. alpinus*), from alpine and sub-alpine Siberia, is about the size of a guinea-pig, greyish-brown above, yellowish beneath. They owe their popular name to the fact that while feeding they often utter a peculiar whistling noise.

Hare, JULIUS CHARLES (1795–1855), an early leader of the Broad Church party, was educated at the Charterhouse and Trinity College, Cambridge, of which he became a fellow in 1818. His first literary effort was a translation of Fouqué's *Sintram* (1820). In 1826 he was ordained. *Guesses at Truth* (1827), the joint work of Julius and his brother AUGUSTUS WILLIAM (1792–1834),

showed the influence of recent German thought on the teaching of Coleridge. He subsequently translated Niebuhr's *History of Rome* in conjunction with Thirlwall. He was appointed to the living of Hurstmoncencx in 1832, and in 1840 became Archdeacon of Lewes. His edition of the *Essays and Tales* of John Sterling (1848), who had been his curate at Hurstmonceux, was accompanied by a life of the author, written from the point of view of an Anglican churchman. This work is now memorable only as having incited Carlyle, who had far more sympathy with Sterling's genius, to write his own graphic biography.

Harebell, or HAIRBELL, the blue-bell of Scotland (*Campanula rotundifolia*), a common wild flower of dry and sandy spots in northern regions. It has a perennial slender rhizome bearing petiolate roundish radical leaves from which it gets its name, though the more prominent cauline leaves are sub-sessile and linear. Its slightly drooping flowers on their slender hair-like stalks form a paniculate cyme; its superior calyx has five small erect sepals, and its pretty pale violet-blue bell-shaped corolla has five slightly recurved acute lobes. There are five epigynous distinct stamens with short filaments and linear anthers, and a capsule opening by pores near its base.

Hare Indians, a branch of the Athabascan family [ATHABASCANS] thinly scattered over a large part of the former Hudson Bay Territory, Dominion of Canada. The English "Hare" answers to the Franco-Canadian *Peaux-de-Lièvre*, which represents the true tribal name *Kha-cho-Gottiné*, that is, "Dwellers amongst the great Rabbits." They are a hunting tribe, whose range extends from the Great Bear Lake northwards along the banks of the Mackenzie, Anderson, and MacFarlane rivers to the Eskimo territory, round the shores of the Frozen Ocean—a region about 80,000 square miles in extent, with a total population scarcely exceeding 800. At present the Hare Indians find employment chiefly in the service of the Hudson Bay Company as trappers, carriers, and assistants at the stations. They are a gentle, harmless people, but indolent and somewhat quarrelsome over trifles. In physical appearance and speech they closely resemble the Chippewayans of Lake Athabasca. Many have been converted by the French missionaries. (E. Petitot, *Bulletin de la Société de Géographie*, passim.)

Hareld, either of the two species of Harelda, an Arctic genus of Ducks, in which the tail is wedge-shaped, and its two middle feathers very long.

Hare-lip, a congenital defect due to arrested development of the parts which form the upper lip. Hare-lip is usually unilateral, there being a small cleft in the upper lip a little to one side of the median line; cases of double hare-lip are occasionally met with. The only remedy for the condition is a surgical operation.

Harem (Arabic *haram*, "prohibited" or "sacred"). The portion of an Eastern household set apart for the women, into which no men, excepting

occasionally their nearest relations, are allowed to enter. The name is also applied to the women themselves. The Koran does not allow more than four wives—except in the case of the Sultan, who may have seven—but a man is permitted any number of concubines. The wives and concubines in the Sultan's harem are, like their female attendants, slaves, generally brought from Circassia or Georgia. The harem is usually under the management of the Sultan's mother, who is called "Sultana," assisted by a trusty female superintendent. The duty of keeping watch over its members is entrusted to a body of eunuchs. The inmates spend their time in spinning, sewing, and other light household labours; also in adorning their person, walking in their gardens, watching the dances of slaves, etc. The mother of the Sultan's eldest male child, whatever her previous position, is regarded as his chief wife. When he dies those who have borne him daughters only regain their freedom, but those who have borne him sons are placed in the "old seraglio." The harem is confined to the richer classes; poor Moslems have only one wife.

Hare's-ear, the popular name of the genus *Bupleurum*, which is represented in England by four rare species. They are glabrous herbs, exceptional in their order in having simple entire leaves, which in some species are perfoliate or amplexicaul, whence they were also once known as *Thoron-nax* or *Thoron-leaf*. The compound umbels of yellow flowers are surrounded by numerous leafy bracts or bracteoles.

Hargreaves, JAMES (d. 1778), the inventor of the spinning-jenny. Originally settled as a weaver at Stanhill, near Blackburn in Lancashire, he was obliged to remove to Nottingham, owing to the hostility of his fellow-workmen (1767). He afterwards took out a patent for his invention, but it was rescinded on the ground that, before obtaining it, he had sold some of his machines.

Haricot-bean, the ripe seeds of the French or kidney-bean (*Phaseolus vulgaris*), a valuable article of food much used on the Continent, especially during Lent. They contain 52 per cent. of starchy matter, 23 of albuminoids, and 14 of water, so that one pound of these beans might produce nearly $3\frac{3}{4}$ oz. of the dry nitrogenous substance of muscle.

Harikari, or HAKAKARI, a form of suicide formerly allowed in Japan to members of the privileged classes who were condemned to death. It consisted in ripping the body open by means of two gashes, one of which was perpendicular and the other vertical.

Hariri, ABU MOHAMMED AL KASIM BEN ALI, a celebrated Arabian fabulist, was born at Basra, about the middle of the 11th century. He wrote poems and treatises on grammar, but his chief work was his *Makamat*, a series of highly humorous stories in rhymed verse, which is celebrated for the beauty of its style.

Harlech and Longmynd Beds, the lower group of the Lower Cambrian system (q.v.), grey,

purple, and red flags, sandstones and slates, with shaly beds and conglomerates, estimated at 4,000 feet thick in South Wales, on the north side of St. Bride's Bay in Pembrokeshire; at over 8,000 feet in North Wales, between Barmouth and Harlech, and in the slate district of Penrhyn and Llanberis; and at perhaps 25,000 feet in the Longmynd hills of Shropshire. The rocks of this series are in many places penetrated by igneous dykes, and exhibit distinct cleavage; but ripple-marks, sun-cracks, the impressions of rain-drops and worm-tracks (*Arenicolites*) indicate their shallow-water near-shore origin. They apparently rest unconformably upon Archæan rocks, the junction near Bangor being marked by a bed of conglomerate; but they pass conformably upward into the Menevian and Lingula Flags. Once thought unfossiliferous, they have yielded the oldest known assemblage of undoubted fossils, including a sponge (*Protospongia*), *Lingulella ferruginea*, *Discina*, and other brachiopods, the pteropod *Theca*, and *Paradoxides*, *Agnostus*, and several other genera of trilobites, besides worm-tracks.

Harlequin Duck (*Clangula histrionica*), an arctic wild-duck about a foot and a half long, which owes its popular name to its strongly-contrasted coloration of black, rufous-brown, and white.

Harley, ROBERT, Earl of Oxford and Mortimer (1661–1724), an English statesman, belonged to an old Herefordshire family. He was brought up as a Whig and a Dissenter, but soon after entering Parliament he joined the Tories. In 1701 he was chosen Speaker. Admitted to the Ministry of Marlborough and Godolphin in 1704, he became the leader of the Tory section, and made use of his cousin, Mrs. Abigail Hill (subsequently Mrs. Masham) to prejudice the queen against Marlborough, but the Whigs discovered his intrigues and he was dismissed (1708). In 1710 he was made Chancellor of the Exchequer and placed at the head of a Tory Administration with St. John as Secretary of State. He at once entered into secret negotiations with France, perhaps hoping that after peace had been secured the French would assist in effecting a restoration of the Stuarts. An attempt to stab him in the Privy Council, made by a French refugee named Guiscard (1711), increased his popularity; he was created Earl of Oxford and given the post of Lord High Treasurer. After the Treaty of Utrecht (1713) he was prevented by his vacillating character and love of intrigue from adopting the distinctly Jacobite tactics pursued by his colleague St. John (now Lord Bolingbroke), but he certainly gave some countenance to the hopes of the Pretender. In 1714 a quarrel with Bolingbroke, who had gained the support of Mrs. Masham, resulted in his dismissal. After the arrival of George I. he was impeached and imprisoned in the Tower (1715). Two years later he was brought to trial, but acquitted. The remainder of his life was passed in retirement. Harley was a man of literary tastes and a friend and patron of Swift, Pope, and other men of letters. He founded the Harleian collection of books and MSS., now in the British Museum.

Harmaline, an alkaloid of composition $C_{13}H_{14}N_2O$, which together with another, closely related to it, *harmine* $C_{13}H_{12}N_2O$, exists in the seeds of wild rue, *Peganum harmala*, and to which these seeds appear to owe their medicinal properties, being used in the East as a stimulant and narcotic.

Harmattan, a hot dry wind common on the coast of Guinea during December, January, and February. It blows seawards from the interior, and its approach is generally heralded by dense clouds of sand. It is destructive to vegetation, but tends to remove dysentery, fevers, and epidemic complaints.

Harmine. [HARMALINE.]

Harmodius and **Aristogeiton**, two Athenians who in 514 B.C. attempted to deliver the city from the rule of the Pisistratidæ, and succeeded in murdering Hipparchus, younger brother of the tyrant Hippias. Harmodius was immediately slain by the body-guard of Hippias, and Aristogeiton was afterwards seized and put to death. Four years later Hippias was expelled by the Spartans.

Harmonic. The *harmonic mean* between two numbers is the reciprocal of the arithmetic mean of their reciprocals. Thus if we take the numbers 4 and 12, their reciprocals are $\frac{1}{4}$ and $\frac{1}{12}$. The average of these is $\frac{1}{6}$, and the reciprocal of this average is 6. Hence 6 is the harmonic mean between 4 and 12. It may be noticed that the arithmetical mean (q.v.) between the same two numbers is 8, and their geometrical mean (q.v.) is $\sqrt{4 \times 12} = 6.928$. The harmonic mean, therefore, is the smallest, the geometrical next, and the arithmetical mean the greatest. This may be proved to be always the case with any pair of numbers. [HARMONIC PROGRESSION.] Three numbers are said to be in *harmonic proportion* when the second is the harmonic mean between the first and third. In the applications of the above to geometry we have exactly similar definitions of lines in harmonic proportion, for their lengths are expressed by numbers. Suppose four points A, C, B, and D, to lie in the order given; then the distances A C, A B, and A D, being in harmonic proportion the points are called harmonic points and such a series possesses definite properties that distinguish it from others. The point C divides A B internally in a definite ratio; the point D will divide it externally in the same ratio. If C is close to B, the fourth harmonic D will also lie close to B, but on the farther side of it. As C gets nearer to the centre of the line A B, D recedes farther from B. When C becomes the mid-point of A B, D is at infinite distance along the line. When C is nearer A than B, its fourth harmonic will lie on the A side of the line. If O be any point on the circle described with A B as diameter, O A and O B will be at right angles to each other; this is proved by Euclid. The lines O A, O C, O B, and O D, form what is called a harmonic pencil, and the angle D O C will be found to be bisected by O B. This supplies a graphical method for finding the fourth harmonic of three points. The word harmonic has been given

on account of the applications of these principles to the theory of musical sounds.

Harmonic Motion is a periodic motion that exactly repeats itself after equal intervals. A simple harmonic motion is an oscillatory motion in a straight line from one side to another of a fixed point in the line called the *centre*. The rate of change of its speed is proportional to its distance from the centre, the special terms of the proportion settling the *period* or time taken for the moving point to perform a complete cycle in its path of motion. Its greatest distance from the centre is called the *amplitude*, variations in which will not affect the period of oscillation. The study of harmonic motions is of much importance in oscillations of all kinds, such as those of matter transmitting sound or of ether transmitting radiation.

Harmonicon is a musical instrument in which notes are produced by transverse vibrations of plates of glass on metal supported on strings one quarter of the distance from each end.

Harmonic Progression. A series of numbers are in harmonic progression when their reciprocals form an arithmetical progression. Thus we may have the A. P.— $\frac{1}{120}, \frac{1}{120}, \frac{1}{120}, \frac{1}{120}$. Taking their reciprocals, we get the H. P.—12, 15, 20, 30. Any three consecutive terms of such a series are in harmonic proportion. [HARMONIC.]

Harmonics, in *Acoustics*, are notes determined by vibrations whose frequencies are in the ratios of 1 : 2 : 3, etc. Given a note produced by 261 vibrations per second, its first harmonic is produced by $2 \times 261 = 522$ vibrations per second, and the second and higher harmonics have frequencies of 783, 1,044, 1,305, and so on. Using the ordinary diatonic scale the fundamental is *c*, first harmonic *c'*, second *g'*, third *c''*, fourth *e''*, fifth *g''*, and so on. In the ordinary scale of eight notes from any one *c* to its octave the frequencies are in the ratios 1, $\frac{9}{8}, \frac{5}{4}, \frac{4}{3}, \frac{3}{2}, \frac{5}{3}, \frac{15}{8}, 2$. The next octave, still compared with the original *c*, would run 2, $\frac{9}{4}, \frac{5}{2}, \frac{8}{3}, 3, \frac{10}{3}, \frac{15}{4}, 4$. And the next 4, $\frac{9}{2}, 5, \frac{16}{3}, 6, \frac{20}{3}, \frac{15}{2}, 8$. Those notes designated by whole numbers 2, 3, 4, 5, 6, and 8, represent different harmonics of the fundamental *c*. It will be noticed that the 7 is absent from the series; this means that the sixth harmonic is absent from the diatonic scale. That special note corresponds nearly with *b''*, but is slightly flatter. Usually when any note is sounded, harmonics may be distinguished at the same time. Experience enables the observer to pick out these up to the sixth or even higher harmonics, but there are methods by which their presence may be demonstrated separately, when collectively they cannot be distinguished. [RESONATORS.] The characters of different sounds depend on the greater or less intensity of the harmonics present. Some may die away rapidly, leaving others to produce their effects; in a violin string we hear the fundamental note and high harmonics, intermediate ones being rapidly suppressed. In a tuning-fork on a sounding-board the fundamental remains and all harmonics disappear quickly.

Remembering that different tones are due to waves of different lengths, it will readily be seen that suppression of certain waves may be effected by mechanical damping of corresponding vibrations. If a stretched violin string be touched at points half way, one-third, one-fourth, or one-fifth of the distance from one end, the notes given out by the untouched segments will be the first, second, third, or fourth harmonic of the fundamental note given by the whole string. The wave-lengths of these different harmonics are in the ratio of $\frac{1}{2} : \frac{1}{3} : \frac{1}{4} : \frac{1}{5}$, etc., and so form a harmonical progression (q.v.).

Harmonium, a musical instrument of the "free reed" class. In the harmonium the air is compressed by bellows and escapes through the reeds, whereas in the American organ—the other type of reed-organ—the bellows cause a vacuum into which the reeds admit the outside air. The reeds or "vibrators" are constructed in the following manner. Narrow rectangular slits cut in a piece of brass-plate are covered with tongues of brass, one end of which is attached to the plate, the other remaining free. The current of air which moves the reeds and thereby produces the musical tone is admitted into the wind-chest in which the reeds are placed through valves below or above the keys in the key-board. The pressure of wind arises through the action of bellows which the player controls by moving the treadles alternately with his feet, thereby pressing down the keys and opening the valves so as to allow the wind to pass from the bellows to the wind-chest. The pitch is not regulated by the force of the pressure, but by the length and elasticity of the reeds, and by the shape and capacity of the channels or air-chambers above each reed. The key-board has a compass of five octaves, from *c* to *c*. The first successful harmonium was made by Dehain, of Paris, in 1840. By the melody attachment, invented in 1864, stress is given to one or more notes in the upper part of the harmony by shutting off all the lower ones. The best harmoniums are now made in Paris. The cheapness of the instrument, and the ease with which it can be played, render it a useful substitute for the organ.

Harmony has been defined as "a proper combination of simultaneous sounds." In early times the term was used in a sense indicating melody or music, but it is now used only in the more restricted sense. It is now distinguished from Counterpoint (q.v.), and is regarded as the more elementary study; but counterpoint was systematically studied far earlier than harmony. Harmony treats of intervals, chords, discords, suspensions, passing-notes, cadences, modulations, progression, and thorough-bass. The rules of harmony have from time to time undergone considerable modification, and at present are by no means immutable; but certain broad principles have been very generally accepted. [MUSIC, COUNTERPOINT, THOROUGH-BASS, ETC.]

Harold I. (HAREFOOT), King of England. [CANUTE and HARDICANUTE.]

Harold II., King of England (d. 1066), was born probably in 1022, his father being Earl Godwine (q.v.) and his mother Gytha, a Danish lady. In Godwine's lifetime Harold was Earl of East Anglia, and on his death succeeded to the earldom of Wessex. He shared his father's banishment in 1051, and retired to Ireland, and was restored with him in 1053. During the reign of the Confessor Harold headed the English party as his father had done, and more than held his own against the Norman party. After the death of Eadward, son of Eadmund Ironside, who had been destined by Eadward the Confessor as his heir, the Earl of Wessex became the only Englishman likely to succeed him. The king, however, had promised the crown to William of Normandy, and Harold, having been ransomed by the latter when made prisoner by Count Guy, of Ponthieu (probably in 1064), promised, according to the Norman writers, to marry his daughter and secure the succession to him, receiving a part of the kingdom as a marriage portion. The whole story is obscure; and if Harold did make such a promise he repudiated it when Eadward acknowledged him on his deathbed as his heir and the Witan elected him to the kingdom.

Harold's reign was a brief and stormy one. He had immediately to repel an invasion in the north led by Harold Hardrada, of Norway (q.v.), and his own brother Tostig, whom he had alienated some years before by acquiescing in the rebellion of the Northumbrians against him and their election of Morkere as earl in his stead. No sooner were these defeated and slain at Stamford Bridge, near York, than Harold had to hurry southwards to oppose Duke William, who had landed in Sussex. The defeat and death of the last Saxon king at Hastings (q.v.) followed.

Though he had made a pilgrimage to Rome, and seen some of the French courts, Harold had not that knowledge of Continental affairs which had belonged to Godwine. He was, however, at least his equal in general ability, and his superior as a military teacher. Though certainly not devoid of personal ambition, it is likely that his efforts to conciliate the Mercian house sprang quite as much from a patriotic desire for the union of the kingdom as from the wish to secure it for himself. The best historical information regarding him is to be found in Freeman's *Norman Conquest*, which is the basis of Tennyson's play.

Harold (HARDRADA, "Stern in Council") King of Norway (d. 1066), was descended from Harold Haarfager, first King of Norway. Having been driven out of the country in his youth, he went to Russia. He then became captain of the Varangians (or bodyguards) of the Eastern Emperor, in whose service he performed exploits against the Saracens and other enemies. When compelled to leave Constantinople on account of the anger of the Empress Zoe, whose advances he had rejected, he escaped again to Russia, but returned to Norway about 1045, and soon after became king. He carried on a long war with Denmark, and in 1066 joined Tostig and the Irish in an invasion of

England. The gigantic Viking was defeated and slain with his chief followers at Stamford Bridge on September 25, 1066.

Haroun-al-Raschid (HÂRUN - ER - RASHÎD, "Aaron the orthodox") the fifth Abbasid Khalif (763-809), was born either in 763 or 766, and succeeded his brother Hadi in 786. He owed his throne and much of his reputation to Yahya ibn Barmek, under whom the Khalifate reached its highest point of prosperity. Harun meanwhile gave himself up to the cultivation of learning and the arts, and Bagdad became a great meeting-place of wise men, poets, and musicians. His fame extended to Western Europe, although his correspondence with Charlemagne does not rest upon good authority. In his old age Harun became jealous of the influence of the Barmecides, and caused the whole family, not excluding his especial favourite, Jaafer, son of Yahya, to be put to death. After this rebellions broke out, and the khalif was marching to put down that of Khorassan when he died at Tus. Little is really known of Haroun's private life, and the stories of his midnight wanderings are purely mythical.

Harp, a stringed musical instrument, which has been in use from a very early period. The ancient Egyptians and the various branches of the Keltic race were especially noted for their skill as harpists. The Egyptian harps, which were sometimes seven feet high and had eighteen strings, were richly adorned with carvings and gems. The large Welsh harp was a "triple" instrument—i.e. it had three separate rows of strings. Out of the Irish harp is said to have grown the variety used in Italy and elsewhere during the Middle Ages. Compared with the perfected harp of modern times, these and other forms were but clumsy instruments, lacking in compass, sonority, and precision of pitch. The Oriental harps seldom had a pillar, and the mediæval kinds were always tuned in the same key, chromatic alterations being possible only by stopping the strings with the fingers. To remedy this defect, pedals were introduced; they first came into use in Germany early in the 18th century. Pedal harps are either "single action" or "double action"; in the latter kind, invented by Erard, of Paris, in 1810, each pedal produces two chromatic changes. The modern orchestral harp has nearly fifty strings of catgut, strung on a wooden frame, which somewhat resembles a triangle, the three sides being formed by the back, the neck, and the pillar. The frame rests on a pedestal containing the pedals, which are connected with the mechanism in the neck by pedal-rods in the pillar. The strings are attached to the neck by wrest-pins, and have their lower ends inserted in the sounding-board at the back. The pedal harp has a compass from contra F to D of the sixth octave above.

Harpoon, a pointed lance, steel-headed and usually barbed, that can be thrown or otherwise projected. To its shank a cord is generally attached. It is chiefly used in hunting large animals of the whale species. Of old, harpoons

were always flung by hand, but they are now more frequently fired from a specially-constructed gun. Some carry in their heads charges which are exploded by electricity or percussion; others have spring barbs, which open out in the body of the victim, and so effectually prevent withdrawal.

Harpsichord, a musical instrument with a key-board and strings, arranged in the same way as in the piano. The sound was produced by means of pieces of leather or crow-quill, which were inserted in "jacks" connected by levers with the keys, and were pushed upwards so as to twitch the strings. The form was usually that of the grand piano, but it was sometimes square or upright; when oblong the instrument was called a spinet or virginal. The sound produced was harsh, and there was no means of regulating its force. The keyboard was from 4 to $6\frac{1}{2}$ octaves in length, with one, two, three, or four strings to each key. The harp is supposed to have been invented in the 14th century. It was known in England before 1502. Bach and Handel played on this instrument, and before the close of the 18th century it was regularly employed in orchestral music, and to accompanying recitations. It has now been superseded by the pianoforte.

Harpy (from a Greek word meaning *to seize*), a creature of Greek mythology, possessing a woman's head and a bird's body.

Harpy Eagle (*Thrasaëtus harpyia*), the single species of a genus of Falconidæ ranging from Mexico to Paraguay. The length of an adult male is a little over 3 feet; the plumage above and on the upper parts of the neck is dark slate; there are three white bands on the tail, and the belly is white. The beak and claws are large, and the head is crested. These birds feed on monkeys, sloths, young calves, and lambs, and sometimes, it is said, carry off children.

Harrari. 1. The natives of the district of Harrar, east frontier of Shoa, South Abyssinia, till lately ruled by an independent emir, but now subject to the Abyssinian emperor. They appear to have been originally Himyaritic Semites akin to the Abyssinians, and, like them, Christians of the Monophysite sect. But although they still speak a dialect of the Geez or Old Himyaritic language, they have long been fanatical Mohammedans of the Shiah sect. Nevertheless, they have preserved many Christian traditions, are nearly all monogamists, and treat their women with great respect, allowing them to go unveiled and relieving them from most of the hard work. They are distinguished by their love of letters, and have developed a certain literature, using the Arabic characters, which, however, are written in vertical lines from top to bottom instead of from right to left. A characteristic local industry is book-binding, and the Harrar earthenware and woven goods are also much prized.

2. A large Arabo-Berber nation, province of Oran, Algeria, where they occupy the elevated plateau watered by the head streams of the Shelif. There are two divisions, the Sheraga ("Eastern")

and Gharabi ("Western") Harrari, the former with fifteen, the latter with five sub-tribes; collective population, 18,000.

Harrier. (1) (The hare-dog), a small hound kept in parks in England for hare-hunting. It differs little from the foxhounds (q.v.), except in being of smaller size. (2) (The bird that harries), any bird of the Falconine genus *Circus*, with 15 species widely distributed in both hemispheres. The un-toothed bill is of moderate length, and there is a face-disk similar to, but smaller than, that of the owls. *C. cyaneus* (the Hen-harrier) and *C. aeruginosus* (the Moor Buzzard) are rare in Britain; *C. cinerascens* (Montagu's Harrier) is a no occasional visitor. The males have bluish plumage on the upper surface (whence the names "blue kites" or "blue hawks"), while that of the females is brown.

Harrier Eagle, any species of *Circæetus*, with four species confined to Africa, and one (*C. gallicus*) ranging to Europe and India. These birds prey upon snakes, whence they are also called snake-eagles.

Harrington, JAMES (1611-77), a political writer of the 17th century, was born at Rand, Lincolnshire, and educated at Oxford. He afterwards visited Holland, Denmark, and Italy, staying at Rome and Venice. He took no side in the Great Rebellion, but was with the king at Holmby and in the Isle of Wight. In 1656 he published his *Oceana*, and in 1661 was sent to the Tower for advocating the carrying out of the political views contained in the book. He was afterwards removed to Plymouth, and released on account of his bad health. Harrington's life was written by Toland the Deist.

Harris. [MALMESBURY, EARL OF.]

Harris, JOEL CHANDLER (b. 1848), the author of *Uncle Remus*, was born in Georgia. He began life as a printer, but eventually became a journalist, and was in 1890 appointed editor of the *Atlanta Constitution*. His chief work, a study of negro folklore, appeared in 1880, and was followed by *Nights with Uncle Remus* (1883), *Mingo*, and other *Sketches* (1884), and other tales.

Harris, THOMAS LAKE (b. 1823), the founder of a spiritualist body called the Brotherhood of the New Life, was born at Fenny Stratford, Bucks, but soon went with his father to America. He returned to England in 1858, and was there again in 1866, but finally settled in California. His brotherhood was founded on the principles of Swedenborg on its religious and of Fourier on its social side, with certain additions of his own. As head of it he exercised supreme influence, among those who submitted to it being Laurence Oliphant (q.v.). Harris's *Arcana of Christianity* and *Modern Spiritualism* set forth aspects of his teaching.

Harrisburg, the chief town of Pennsylvania, stands on the left bank of the Susquehanna, 106 miles N.W. of Philadelphia. Its chief buildings are the Capitol, the state arsenal, and lunatic asylum, a Roman Catholic cathedral, and about forty other churches. There is also a large state library. The

city, though beautifully situated, is a great manufacturing town, steel and iron being the chief industries, and has also a large lumber trade.

Harrison, BENJAMIN (b. 1833), twenty-third president of the United States, and grandson of William Henry, 9th president, was born at North Bend, Ohio. He began to practise as a lawyer at Indianapolis in 1854, and in 1860 became reporter of the Supreme Court of Indiana. He raised a regiment for the Federals during the Civil War, and served with distinction at the battles of Resaca, Peach Tree Creek, and Nashville during the year 1864. He then returned to legal practice, and was at the time an active politician on the Republican side. In 1876 he was an unsuccessful candidate for the governorship of Indiana. Three years later he actively supported Garfield's candidature for the presidency, but declined a seat in his cabinet. In 1880 he became a United States senator, but was not re-elected in 1886. In 1888 he was successful as the Republican and Protectionist candidate for the Presidency, but was defeated by his old democratic opponent, Cleveland, on seeking re-election in 1892, and retired to a professorship in California.

Harrison, FREDERIC (b. 1831), the most prominent advocate of the doctrines of Auguste Comte in England, was born in London, and educated at King's College School and Wadham College, Oxford, of which he became fellow. He was called to the Bar in 1853, and practised in the equity courts, and as a conveyancer, at the same time giving much attention to social and literary questions. He served on the Trades Unions Commission of 1867-9, and as secretary to the Commission for the Digest of the Law (1869-70). In 1877 he was appointed by the Council of Legal Education Professor of Jurisprudence and International Law. Since 1870 he has delivered an annual address to the Positivists at Newton Hall. Many of his contributions to the reviews have been republished, and he is well known as the author of *Oliver Cromwell* ("Statesmen" Series) and *The Choice of Books*. He contested London University as a Home Ruler in 1886, but was unsuccessful.

Harrison, JOHN (1693-1776), inventor of the marine chronometer, was the son of a Yorkshire carpenter. He received little education, and soon began to help his father. In 1726 he invented the "gridiron pendulum." His first chronometer was finished in 1735, and was tested in a voyage to Lisbon. A second was constructed four years later, a third in 1749, and a fourth in 1759. By this it was proved in a voyage to Barbadoes in 1764 that the longitude could be determined within 10 miles, but the Admiralty did not award the inventor the promised premium of £20,000 until in 1775 a fifth watch had been made. The first four are to be seen at the Greenwich Observatory. *The Principles of Mr. Harrison's Timekeeper*, with plates and preface by Maskelyne, appeared in 1767.

Harrison, THOMAS (1606-60), one of Cromwell's generals and a Fifth Monarchy man, the

place of whose birth and parentage are disputed, is first heard of at the beginning of the Great Rebellion. He served under Fleetwood at Marston Moor, and was sent to report the result to the committee of both kingdoms. He was also present at Naseby and at the storming of Basing. In 1646 he entered Parliament, but subsequently took part with the army against it. He was active in bringing on the trial of Charles I., and was a member of the High Court. He distinguished himself at Worcester, and was a member of the Council of State when the Rump was dissolved. He afterwards intrigued with the Anabaptists, and was imprisoned. At the Restoration he was tried and executed as a regicide, being one of the seven excepted from the Act of Indemnity.

Harrison, WILLIAM. [HOLINSHED.]

Harrison, WILLIAM HENRY (1773-1841), 9th President of the United States, was the son of one of the signers of the Declaration of Independence. In early life he served in the army against the Indians, and in 1801 became governor of Indiana territory. In 1811 he defeated the Indians at Tippecanoe, and next year won the victory of the Thames over the English forces. He entered Congress in 1816, became senator in 1824, and in 1828 went as minister to Columbia. In 1840 he was elected President of the United States, but died a month after his installation. His electoral campaign was the first in which mass meetings and processions were held. At the previous election he had been defeated by Van Buren.

Harrogate, a Yorkshire spa, stands on a hill among the moors 17 miles N. of Leeds. Its sulphureous and chalybeate springs, discovered at the end of the sixteenth century, are much resorted to for the cure of skin diseases, dyspepsia, and gout. The town was incorporated in 1884.

Harrow, an agricultural implement, consisting of a frame with iron teeth, employed for smoothing ploughed land and covering seeds. A wooden frame was formerly used, but the whole implement is now usually made of iron. The most important varieties are the "brake," for breaking down hard soil, the "drill harrow," for pulverising between furrows of green crops, and the "chain harrow," composed of iron links, for covering seeds and eradicating weeds.

Harrow-on-the-Hill is a town in Middlesex, 12 miles W.N.W. of London. The church, which stands at the top of the hill, owes its origin to Lanfranc, and is in various Gothic styles. The school, founded by John Lyon of Preston in 1571, was originally intended for the free education of thirty poor parish scholars, but under a clause providing that some "foreigners" might be added to fill up the building the present state of things has been brought about. The fourth form school was built between 1608 and 1615, and several additions have been made during the present century. In the eighteenth century and in the third decade of the present one the numbers declined, but there are now more than 500 boys. They are admitted between the ages of twelve and fourteen. There

are several entrance and some valuable University scholarships. The governing body is elected by the Lord Chancellor, the Universities of Oxford, Cambridge, and London, the Royal Society, and the assistant masters. The most famous headmasters have been Archdeacon Thackeray, Dr. Sumner, Bishop Christopher Wordsworth, Dean Vaughan, and Dr. Montagu Butler, who was succeeded in 1885 by Mr. J. E. C. Welldon. Among the *alumni* may be mentioned Lord Byron, C. S. Calverley, Sheridan and Anthony Trollope, Lord Aberdeen, Sir Robert Peel and Lord Palmerston, Cardinal Manning and Archbishop Trench, Lord Shaftesbury and Sir G. Trevelyan.

Harry, BLIND, sometimes called HENRY THE MINSTREL, about whose life little or nothing is known, was the author of a poem which was long popular in Scotland. The title of the book, which was first printed in 1570, is *The Aetis and Deidis of the illuster and railzeand campioun, Schir William Wallace, Knieht of Ellerslie*. The author is said by Major to have earned his livelihood by going about reciting his work.

Hart, a stag (q.v.) in its sixth year.

Harte, FRANCIS BRET (b. 1839), a distinguished American writer and poet, was born at Albany in the state of New York. He received very little education, and after the death of its head the family went to California. Here Bret Harte set up a school, but afterwards became successively printer, editor, and professor of literature in the university of California. From 1864 to 1870 he was in the United States branch Mint at San Francisco, and in 1868 became editor of the *Overland Monthly*. His name first became widely known in the following year by his humorous verses, *Plain Language from Truthful James*, now commonly known as *The Heathen Chinee*. In 1871 Bret Harte settled in New York. He afterwards went to Europe, being United States consul at Crefeld in 1878-80, and at Glasgow from the latter year till 1885, after which he lived chiefly in London.

Hartebeest. [BUBALINE ANTELOPE.]

Hartford, the chief town of Connecticut, United States, stands on the right bank of the Connecticut river at a distance of 50 miles from its mouth, and is about midway between Boston and New York. It was at first a Dutch fort, but in 1635 was formed into a settlement by a body of men from Massachusetts. It was incorporated in 1784, and became the capital of Connecticut in 1873. Among its finest buildings are the State Capitol of white marble, the United States Courthouse, Trinity College, and the Wadsworth Athenæum. The chief industries are the tobacco trade, the manufacture of Colt's revolvers and Gatling guns, and of hardware and stoneware. Hartford is the headquarters of several large insurance companies. There are a large hospital and several asylums, and among religious institutions are two Romanist nunneries. Hartford was in 1814 the scene of a convention of New Englanders who were opposed to the war with Great Britain. It lasted twenty days, and advocated resistance to impressment and

reforms in the United States Constitution. It was accused by the Democrats of designing to set up a union of New England States; but although there were undoubtedly circumstances which caused a divergence of interests between the northern and southern states, there was no real wish on the part of the former to bring about a separation.

Hartlepool, a seaport in the county of Durham, 18 miles E.S.E. of the city of Durham. It passed from the Bruces when they became the royal family of Scotland, and was then granted to the Clifford family. From the earliest times it has been engaged in the fishing trade, and the manufacture of cement and iron ship-building are also carried on. The shipping trade has been transferred to West Hartlepool, the modern part of the town, which stands on the south of Hartlepool Bay. West Hartlepool, founded in 1847, has a fine harbour, with large docks, shipbuilding yards, and marine engine-building establishments. Coal, in large quantities, flax, grain, and timber are the chief imports; while woollen and cotton goods, cement, machinery, and other products are carried hence to St. Petersburg and the chief Baltic ports. West Hartlepool was incorporated in 1887. The Hartlepoons unite in returning a member to Parliament.

Hartley, DAVID (1705-57), the author of *Observations on Man* (1749), was born near Halifax, and educated at Bradford and Jesus College, Cambridge, of which he became fellow. Being unable to sign the Articles, he abandoned the idea of taking orders, and became a physician, practising at Bury St. Edmunds, in London, and at Bath, where he died. His doctrine of the association of ideas has been very generally accepted; that of vibrations had less permanent value. Hartley, who was a fellow of the Royal Society, and intimate with some of the best men of his time, was engaged for no less than sixteen years upon his great work. His son, by his first wife, named DAVID (1732-1813), was a friend of Franklin and a prominent advocate of the abolition of the slave trade. He represented Hull for several years, and was the author of *Letters on the American War*. He also edited his father's *Observations*.

Hartmann, KARL ROBERT EDUARD VON, the eminent German philosopher, was born in 1842 at Berlin. He served in the Prussian army from 1858 to 1865, after which he settled in Berlin and devoted himself to philosophic studies. He made his name known in 1869, when his *Philosophy of the Unconscions* (*Unbewussten*) was published. This work, which reached a 10th edition in 1890, was translated into English in 1884 by Coupland. It is a combination, under the influence of the teaching of Schelling, of Hegelian idealism with the pessimism of Schopenhauer. Hartmann has also written on æsthetics, *Die Philosophie des Schönen*, etc.; on religion, *Die Religion des Geistes*, and other works; and on political and miscellaneous subjects, *Moderne Probleme*, etc. A summary of his philosophical system was produced by Koeber in 1884.

Hartshorn, SPIRITS OF, the name formerly applied to the solution of ammonia (q.v.), owing to its production, together with some of its salts, by the dry distillation of animal refuse such as bones, hoofs, horns, etc.

Hartzenbusch, JUAN EUGENIO (1806-80), a Spanish dramatist of German descent, was born at Madrid, where he became director of the national library in 1862 after many years in a subordinate capacity. His first play was written in 1836, the title being *Los Amantes de Teruel*. Among his comedies were *La Redoma Encantada* and *La Visionaria*. *Alfonso el Casto*, *La Coja y el Encogido* were the chief of his dramatic poems; he wrote also *Dona Mencía*, and several prose works, and edited the plays of Calderon, Molina, and Lopez de la Vega.

Hartz Mountains, THE, are a chain of hills running through Hanover and Saxony, between the Weser and the Elbe. They are 57 miles long, and 20 in breadth. Their average elevation is about 1,500 feet, but the Brocken is 3,740 feet high. The rocks belong chiefly to the Devonian and Lower Carboniferous formations. Silver, copper, lead, and iron, as well as marble, zinc, and other minerals, are obtained. The Hartz range forms a natural boundary between the High and Low German races, and is often mentioned in German literature.

Haruspices, in the ancient Roman religion, were soothsayers who professed to discover the will of the gods by examining the entrails of the beasts offered in sacrifice. Their prognostications were also drawn from the class of omens called "portents," such as lightning and earthquakes. They are said to have originally come from Etruria.

Harvard University, which is in the town of Cambridge, Massachusetts, and about a mile north-east of Boston, was founded in 1638. Mr. John Harvard, an English clergyman, having come to Charlestown, Massachusetts, a year before his death, left £780 and his library for the foundation of a college for the education of the English and Indian youth of the country. Only one Indian actually graduated. The endowment was supplemented by grants from Massachusetts and by contributions from the churches, and the college continued till the present century to be a theological seminary under state control. Since 1865 it has been governed by a board of thirty overseers elected by the *alumni*, one-sixth of the body being renewable every year. The appointment to professorships and the control of property is, however, practically in the hands of the "corporation," consisting of the president and five fellows. The number of students is upwards of 2,000, of which some 1,200 are attached to Harvard College, the Medical School having about 300 and the Law School rather less. There are 71 professors, and about 150 assistants and tutors. The total income of the university is estimated at more than £100,000 a year. The age of matriculation is usually about 18. The two main departments of study are the classical and the scientific; but a student following either of these courses has to devote a certain amount of attention to the other.

The terms amount to about forty weeks in the year. The education of women is provided for. Ladies may have access to the university library and may obtain, after a four years' course, a certificate equivalent to the Bachelor's Degree. The chief glories of Harvard are the Memorial Hall, a large building erected in honour of the *alumni* who fell in the Civil War, having a dining hall hung with portraits, where the public "exercises" are given; the Agassiz Zoological Museum, and the Peabody Ethnological and Archæological Museum. There are also a library containing 250,000 books, a fine observatory, and a botanical garden. Harvard University is the chief seat of learning in the New World.

Harvey, SIR GEORGE (1806-76), Scotch painter, the son of a watchmaker, was born at St. Ninians. He was apprenticed to a bookseller, but at the age of twenty exhibited a picture at the Edinburgh Institution, and was made one of the original associates of the Royal Scottish Academy. In 1829 he became a full member, and in 1864, when he was knighted, became president. He excelled alike in figure-pictures and in landscapes. Of the first, the *Covenanters' Preaching* (1829-30) and *Shakespeare before Sir Thomas Lucy* (1836) are well-known examples, and among his finest landscapes are *Ferragon* (1857) and *Sheepshearing* (1859).

Harvey, SIR HENRY, naval officer, was elder brother of Captain John Harvey of the *Brunswick*, and was born in 1737. Having attained post-rank in 1777, he commanded the *Ramillies*, 74, in the victory of June 1st, 1794, and was immediately afterwards promoted. In 1797 he captured the island of Trinidad from the Spaniards. He died, in 1810, an Admiral of the White.

Harvey, SIR THOMAS, naval officer, born in 1775, served in the *Ramillies* in the action of June 1st, 1794, and in the *Prince of Wales* in that of June 23rd, 1795. He was posted in 1797, and commanded the *Prince of Wales*, 98, in the attack on Porto Rico in that year, and the *Lapwing* in the expedition to Surinam. He became a rear-admiral in 1821, and died a vice-admiral, a K.C.B., and commander-in-chief on the North American station in 1841.

Harvey, JOHN, naval officer, born in 1740 at Elmton, Kent, entered the navy in 1755, and became a captain in 1777. He was for some time in chief naval command at Gibraltar during the famous siege, and in that capacity greatly distinguished himself. In 1793 he was appointed to the *Brunswick*, 74, and in her was mortally injured in the hour of victory on the Glorious First of June, 1794. A monument to his memory was erected by the nation in Westminster Abbey.

Harvey, WILLIAM (1578-1657), the discoverer of the circulation of the blood, was the eldest son of Thomas Harvey, of Folkestone. He was educated at the King's School, Canterbury, and at Caius College, Cambridge, after leaving which he went to study at Padua, where he also took the degree of M.D. In 1609 he was made physician at St. Bartholomew's Hospital, having previously become

a fellow of the Royal College of Physicians. In 1618 he became physician extraordinary to James I., and was afterwards physician in ordinary to that king and his successor. He was present at the battle of Edgehill, and went to Oxford with Charles I., by whose favour he was appointed in 1645 warden of Merton. After the capture of the city he returned to London, where he died of gout. He was buried at Hempstead, Essex. It was in his Lumleian lectures of 1616 that Harvey first gave utterance to his thoughts on the circulation of the blood, but it was not till 1628 that his *Exercitatio Anatomica de Motu Cordis et Sanguinis in Animalibus* was published at Frankfort. The discovery was accepted in England but opposed by several foreign physicians. By the time of Harvey's death it was, however, generally admitted. A translation from the Latin of his complete works was published by the Sydenham Society in 1847, and a new edition appeared in 1881. Harvey was a man of great learning, being especially conversant with Aristotle. He presented a library to the College of Physicians, to whom he also left his estate of Burwash in Sussex. In 1654 he was elected president, but declined the honour on account of his advanced age.

Harwich, a seaport of Essex, situated on a neck of land on the southern shore of the estuary of the Stour and Orwell, 18 miles E.N.E. of Colchester. It is an old borough dating from the 14th century, and till 1885 returned a member to Parliament. It has a large fortified harbour, and its suburb, Parkeston Quay, is a starting-place of steamers to Antwerp and Rotterdam. Ship-building, fishing, and cement-making employ the inhabitants. Dovercourt, to the south of Harwich, is a pleasant watering-place with a sea-wall 2 miles in length.

Hasdrubal, a name which was not uncommon among the Carthaginians. Two bearers of it are famous in history: (1) A member of the popular party at Carthage, who, having married the daughter of Hamilcar Barca, accompanied him to Spain, succeeded to his command in 229 B.C., and founded Nova Carthago (Cartagena). He was assassinated in 221 B.C. (2) The son of Hamilcar, and younger brother of Hannibal. During the first part of the Second Punic War he commanded the Carthaginian forces in Spain with varying success. In 216 B.C. he was ordered to join his brother in Italy, but was defeated by the Romans near the Ebro. In 212, however, he gained great successes over them, and, although next year the younger Scipio captured New Carthage, Hasdrubal was able to cross the Pyrenees. Early in 207 he appeared in Italy, and advanced into Umbria, but was defeated and slain at the battle of the Metaurus by the Consuls Livius and Nero. It is said that, in order to discourage Hannibal, his brother's head was thrown into his camp by the Romans.

Hase, KARL AUGUST VON (1800-90), a German theologian, was born at Steinbach in Saxony. He was expelled from Erlangen University on

account of his connection with the "Burschenschaften," a political union of students, and was afterwards imprisoned for ten months at Hohenasperg for similar reasons. In 1830 he became professor of theology at Jena, and there passed the rest of his life. In 1883 he was ennobled for his services to Protestant theology. His most popular works were *Lehrbuch der Evangelischen Dogmatik* (6th ed., 1870); *Hutterus Redivivus* (12th ed., 1883); a *Life of Jesus* and a *Church History*, of which an 11th edition appeared in 1886. He also left an autobiography down to 1830, under the title *Ideale und Irrthümer*, and an unfinished Church history.

Hashem, the name of several Algerian tribes, now mostly Arabised, but originally a branch of the historical Zenata Berbers, whose chief stronghold was the famous city of Flemcen in the province of Oran. Abd-el-Kadir, the valiant Algerian chief who held out for so many years against the French, was a member of the Hashem tribe settled in the district of Mascara, south-west of the city of Oran. Since the French conquest the Hashem nation has lost all political cohesion, and is now dispersed in small fragments over the whole of Algeria with a collective population of less than 20,000.

Haslar Hospital. The Royal Naval Hospital at Haslar, near Gosport, was begun in 1716 and completed in 1762. It is a regular brick building of four storeys, standing in grounds of 33 acres. The main front is 567 ft. long, and the building contains 114 wards, most of which have a uniform length and breadth of 60 ft. by 24 ft. Forming part of the establishment are governor's and surgeons' quarters, a chapel, and a cemetery, etc.

Hassasna, the name of four Berber tribes, province of Oran, Algeria. The first occupy the arid steppe east of Sidi bel-Abbes on the route to Mascara; the second inhabit the Mahafi district west of Relizane; the third are seated on the elevated plateau in the basin of the Shott-esh-Shergui, south-east of Saida; the fourth lie farther west in the Shott-el-Gharbi district; total population, about 10,000.

Hassein, the name of several Algerian tribes, the most powerful of whom are those of the Great Kabyle uplands in the province of Constantine. All are originally Berbers, and many still speak dialects of the primitive Berber language, while others are now of Arabic speech.

Hastings, a seaport in Sussex, lying between two hills, 62 miles south of London by the nearest railway route, and 33 miles east of Brighton. The name is said to be derived from a Danish rover. In the Bayeux Tapestry it is called Hestinga-caestra. The site of the original town is now covered by the sea. William the Conqueror erected a fort on the western hill, where the castle was afterwards built, and made it one of the Cinque ports. In 1377 the town was burnt by the French. It received its charter in the first year of Elizabeth, and this was enlarged by Charles II. From 1370 till the last Reform Bill Hastings returned two members to

Parliament, but now sends one. On the western hill there are the ruins of the old castle consisting of two towers, and in 1824 a Norman chapel was excavated. The principal old churches are those of All Saints and St. Clement's, in the Perpendicular style. There are also a Roman Catholic college and Augustinian monastery. The town hall was built in 1823, and the Albert Memorial in 1864. The Alexandra Park, 70 acres in extent, was opened in 1882. Some little way beyond the West Hill lies St. Leonards, the more modern and fashionable part of the united borough. Hastings Pier is 900 feet long, and has at its farther end a large pavilion. At St. Leonards a new pier was opened in 1891. Besides the long line of open parades, there is the Marina, a covered-in parade 600 feet long. Hotels are numerous, and every convenience and luxury tempts the visitor. The coast and inland scenery towards the east are picturesque in the homely English style. Fishing and boat-building employ a large section of the inhabitants, but provision for the wants of invalids and other visitors affords an occupation to a still larger number.

Hastings, FRANCIS RAWDON-HASTINGS, MARQUIS OF (1754-1826), one of the ablest of the Governor-Generals of India, was the eldest son of the first Earl of Moira. He left Oxford without taking a degree, and in 1773 went to America as a lieutenant in the army. He served with distinction throughout the war, and in 1778 was made adjutant-general in America. He commanded the left at the battle of Camden (August 16, 1780), and on April 25, 1781, won the battle of Hobkirk's Hill. Soon after this he sailed for England, and was captured on the way by a French cruiser, but speedily exchanged. He entered the Irish Parliament, and in 1783 was created an English peer. At first he acted with Pitt, but afterwards joined the Opposition, and as Lord Moira became the intimate friend of the Regent. He served under the Duke of York in Belgium, and in 1797 was talked of as head of a Whig Ministry. He strongly opposed the Irish Union in both Parliaments. After being some time commander of the forces in Scotland, he joined the "Ministry of All the Talents" as Master of the Ordnance. After the death of Perceval he was again destined for office, but soon after Lord Liverpool became Premier Lord Moira went to India as Governor of Bengal. Here he remained from 1813 to 1823. His term of office was marked by the subjection of the Goorkha state of Nepaul, for the conduct of which he, in 1816, was made a Marquis; by the defeat of the Pindharees and Mahrattas in 1817-18; by the purchase of Singapore (1819); and by the ability with which financial and administrative questions were treated. Notwithstanding all this, and the considerable additions he had made to their territory, he was accused by the East India Company of being interested in a banking firm which had made a loan to the Nizam, and in consequence of the feeling which was displayed he resigned in 1821. In 1824 he was made Governor of Malta, and died on board ship in Baiae Bay two years later. His family had no connection with that of Warren

Hastings, whose career was in some respects so much like his own.

Hastings, WARREN (1732-1818), was born at Churchill in Oxfordshire. The expense of his education at Westminster was borne by his uncle. When the latter died, the boy's guardian sent him to India as a writer. In 1755 he became a member of the Council at Kasim Basar, and he was imprisoned at Murshidabad when, in 1756, the Nawab of Bengal took Calcutta. After its recapture he was sent by Clive as resident to Murshidabad, where he first came into conflict with Nand Kumar (Nuncomar). In 1761 he was summoned to Calcutta, and was soon after sent by Vansittart to Patna to settle commercial disputes. The first period of Warren Hastings's career was closed when, in December, 1764, he returned to England. In 1769 he was sent out as second councillor at Madras, and two years and a half later was appointed Governor of Bengal. He immediately set about reforming the finances by putting the collection of revenue in the hands of natives under English supervision, and in reorganising the judicial system. At this time, in accordance with the "Regulating Act" (1773), Hastings was appointed Governor-General, but could act only with the advice of his council of five. Of these all except one, Barwell, united to oppose his views. Nand Kumar, an Indian official, supported them by charging Hastings with corruption. Hastings in return charged him with conspiracy. Meanwhile Nand Kumar was tried before Chief Justice Sir Elijah Impey on a charge of forgery brought by private individuals, and condemned by him to be hanged. Macaulay charged Hastings with a judicial murder in this matter, but Sir James Stephen and others have shown that there is little or no case against him. The Governor-General had sent in a conditional resignation when charged with corruption, but when he heard of its acceptance he refused to submit, especially as all of his opponents, except Francis, were now dead. At this time, in August, 1780, the quarrel between Hastings and Francis came to a head, and a duel was fought at Alipore, after which Francis returned, severely wounded, to England. In 1781 occurred "the robbery of the Oudh Begums," of which so much was made in the trial of the Governor-General. Early in 1785 Hastings resigned the governorship and sailed for England. He had long retained with difficulty his position, the Court of Directors being dissatisfied with the smallness of the revenue returns. Francis had for some time been fanning an agitation against him, and Burke eagerly took up the matter. An impeachment for extortion and illegal measures was carried by a large majority, and Burke, Sheridan, and Fox as managers delivered highly eloquent orations. However, after a trial, which occupied 145 days and extended over more than seven years, Hastings was acquitted. Although ruined by the expense, he was saved from insolvency by a grant from the Court of Directors. In 1814 he became a Privy Councillor, and in his old age received many other honours. He refused a

peerage unless coupled with a public reparation, which was denied him. Judged by the standard of his own times, he is now shown to have been in personal integrity far superior, and in other respects at least morally equal to his contemporaries.

Hastings Sand, a series of fresh-water sands, with subordinate beds of clay, shale, lignite and calcareous sandstone, in all nearly 1,000 feet thick, forming the lower part of the Wealden series of the Lower Cretaceous. They are named from their development in the cliffs at Hastings, Sussex. Near Battle and in the Isle of Purbeck they can be traced conformably downwards into the Purbeck series and elsewhere, though rarely, conformably upwards into the Weald clay. The series is subdivided as follows:—

Tunbridge Wells Sand	{	Upper Tunbridge Wells Sand with Cuckfield Clay. Grinstead Clay. Lower Tunbridge Wells Sand.
Wadhurst Clay.		
Ashdown Sand, with Fairlight Clays at its base.		

The sands are often false-bedded, the clays occur at varying horizons, and clay-ironstone and limonite in the Wadhurst Clay was the chief source of the iron of the Sussex iron-works which flourished in the 16th and 17th centuries. A calcareous sandstone, known (from Tilgate Forest near Cuckfield) as Tilgate Stone, occurs at several horizons and is rich in reptilian remains, including crocodiles, *Iguanodon*, *Hylæosaurus*, and other dinosaurs. These animals were discovered by Dr. Mantell in the Cuckfield district. Some hard beds in the Tunbridge Wells Sand form the remarkable Toad-rock and the High Rocks near Tunbridge Wells. Beds containing small species of *Cyrenia*, a fresh-water bivalve, are not infrequent, and fossil-ferns, horse-tails, cycads and conifers also occur.

Hatch, EDWIN (1835–89), a liberal theologian, was born at Derby, his father being a Nonconformist. He was educated at King Edward's School, Birmingham, and Pembroke College, Oxford. He took orders in the English Church, and after some parochial experience in East London, was for three years (1859–62) professor of classics at Toronto, and for four years rector of the Quebec High School. In 1867 he returned to England, and was Vice-Principal of St. Mary Hall, Oxford, from that date till 1885. In 1880 he was Bampton Lecturer, and from 1882 to 1884 Grinfield Lecturer on the Septuagint. In 1884 he was also appointed Reader in Ecclesiastical History. His *Organisation of the Early Christian Churches* (Bampton Lectures) was translated by Harnack. Among his other works were *The Growth of Church Institutions* (1887), and *Essays in Biblical Greek* (Grinfield Lectures), (1889), and he had begun a *Concordance to the Septuagint*.

Hatfield, a market-town in Hertfordshire 18 miles N.N.W. of London. It was formerly the property of the Bishops of Ely, and is hence sometimes called Bishops Hatfield; but the palace and manor were seized by Henry VIII., and the former became a royal residence. Hatfield House was built in 1611 by Sir Robert Cecil, afterwards

Earl of Salisbury, and still continues to be the property of his descendants.

Hathras, a town in the North-West Provinces of India, 21 miles S. of Oligarh. Sugar, cotton, grain, and oil-seeds are exported in large quantities, and the town is celebrated for its carved work.

Hatto, the name of two Archbishops of Mainz. The second, and more famous, when Abbot of St. Boniface, was sent by Otho I., Holy Roman Emperor, as his ambassador to the Pope in 961, and was afterwards, as Archbishop of Mainz, one of his chief councillors. His subsequent career is legendary. Tradition said that he was punished for his oppressions by being devoured by rats in the Mäüsethurm, near Bingen, on the Rhine. He died about 970.

Hatton, JOHN LIPTROT (1809–86), a popular musical composer, was born in Liverpool of a musical family. He played a part in *Othello* at Drury Lane in 1832, and it was as chorus conductor in this theatre in 1842–43 that he first became known. He was afterwards employed as conductor of the Glee and Madrigal Union, conductor for Charles Kean at the Princess's, and of the Ballad Concerts at St. James's Hall during their first nine seasons. Among his best-known works are the cantata, *Robin Hood*, *When Evening's Twilight*, a part-song, and, among his numerous songs, *To Anthea*, and *Simon the Cellarer*.

Hauff, WILHELM (1802–27), a German writer of some performance and great promise, was born at Stuttgart and educated at Tübingen. He was for a short time a private tutor, and had edited a paper for some months when he died so prematurely. He is chiefly remembered by his *Märchen* and others of his tales, such as *Das Bild des Kaisers*, and *Die Betterin vom Pont des Arts*. He also wrote *Phantasien im Bremen Rathskeller*, a few satires and poems, and *Lichtenstein*, a once popular romance. An 18th edition of his complete works appeared in 1882.

Haulbowline, a royal dockyard situated on an island in the Cove of Cork, opposite Queenstown. It includes a fine dock 425 feet by 94 feet, and a basin entrance 720 feet by 94 feet, with a basin 530 feet wide and 2,110 feet of quayage.

Hausa (HAUSSA, HOUSSA), one of the great nations of Central Soudan, whose domain extends from the west frontier of Bornu westwards to the Niger, and from the Benue river northwards to the Sahara. Here are situated the so-called *Hausa Bokoi* ("Seven Hausas"), that is, the seven original Hausa States, which were overthrown at the beginning of the present century by the Fulah conqueror, Othman dan Fodio, and which now form part of the Fulah empire of Sokoto. [FULAHS.] But the Hausas have preserved their nationality intact, and are gradually absorbing their Fulah rulers. Thanks to their intelligence and commercial spirit their language has become the chief medium of intercourse from Lake Chad to the Gulf of Guinea, and the Hausas appear destined to

become the dominant people throughout Central and West Soudan. They are Mohammedans of a mild type, thus holding an intermediate position between the fanatical Fulahs and the pagan Negro populations. The national traditions, physical type and language show that they are not full-blood Negroes, but a Negroid race profoundly modified by long contact with the Hamitic Berbers and Tibus of the Sahara. The hair is woolly, and the skin dark, but the features are mostly regular, with a cheerful, pleasant expression contrasting favourably with the somewhat brutal appearance of their Kanuri (Bornu) neighbours. Their soft melodious language differs greatly from the Kanuri, and shows certain Berber and Tibu affinities, confirming the general impression of their mixed descent from the Soudanese and Saharan populations. The national name *Hausa* appears to be of recent origin, being unknown to Leo Africanus or any other writers earlier than the 16th century. It is probably connected with the term *Ausa* applied by the Berbers to the region east of the Niger in opposition to *Gurma*, the region west of that river. But there are two forms, *Hausana* and *Ba-Hauehé*, the prefix of the latter being identical with the collective prefix *ba* of the Bantu peoples in the southern half of the continent. As enterprising traders and skilful craftsmen the Hausas have acquired a marked superiority over all the surrounding populations, a superiority which is independent of political fluctuations, and which has survived their own political ascendancy. They have always been friendly to the English, and most of the native troops in the service of the Crown and of the British chartered companies are raised in the Hausa States. They were of much service in the Ashantee war. Recently (1892) an association has been formed in London for the study of the Hausa language, which is spoken with remarkable uniformity by probably not less than 20,000,000 natives of Central and West Soudan (Denham and Clapperton, *Travels and Discoveries*, 1826; Barth, *Travels*, 1857; Baikie, *Observations on the Hausa and Fulfulde Languages*, 1860; Rev. F. Schoen, *Grammar* (1862), and *Dictionary* (1877) of the Hausa Language.)

Hauser, KASPAR, a young German whose strange history excited a good deal of attention in the second quarter of the 19th century. In May, 1828, he appeared in Nuremberg dressed like a young peasant, with a letter to an officer in the town. According to his story, he had passed his life sitting in a cage, and had been fed on bread and water by a man who also taught him how to write. This man had at length clothed him and brought him to Nuremberg, and had then disappeared. Fifteen months later he received a wound on his forehead which he attributed to the same person, of whom, however, no trace could be found. Hauser now became one of the sights of the town, and, having been visited by Lord Stanhope, was adopted by that nobleman and sent to Ansbach to be educated. He at first made great progress, but soon began to deteriorate both mentally and morally, until in December, 1833, he was

again wounded, this time in the side, but, as he said, by the same man. Three days after he died, and the mystery remained unsolved. It appears probable that he was either the victim of a ruthless parent or enemy, or else was a madman. Some believed him to be heir to the throne of Baden, but the government produced in 1875 documentary evidence in disproof of the assertion.

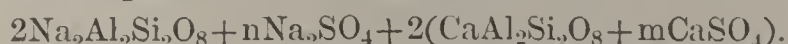
Hausmannite, a dark brown mineral consisting of an oxide of manganese, represented by the formula Mn_3O_4 , which occurs crystallised in quadratic pyramids, chiefly at Thuringia and the Hartz mountains. It has a specific gravity of 4.8, and crystals may be artificially prepared by heating the powdered oxide in a stream of hydrochloric acid gas, HCl. By cold sulphuric acid a mixture of *manganous* and *manganic* sulphates is obtained, while if warmed with hydrochloric acid chlorine is liberated—



Hausmann, GEORGE EUGENE, BARON (b. 1809), was born in Paris, and having entered the service of the state rose to be Prefect of the Seine in 1853, and held the position till 1870, when he was dismissed. He was very energetic in carrying out public works, and was rewarded for his service by Napoleon III., who made him a senator and ennobled him. His improvements, however, not only involved much destruction of historic buildings, but were undertaken with an entire disregard of economy. He was for some time a director of the Crédit Mobilier, and in 1881 was elected to the Chamber of Deputies.

Haüy, RENÉ JUST (1743–1822), an eminent French mineralogist, was born of poor parents at St. Just, Oise, in 1743. Sent by friends to the College of Navarre, Paris, he at first devoted himself to botany, but afterwards to crystallography, the pyro-electric properties of minerals and general mineralogy. He discovered the geometrical laws of cleavage in crystals (q.v.) and the connection between pyro-electricity and hemihedralism. He was a canon of Notre Dame, and became professor of mineralogy at the Museum of Natural History. He died in 1822.

Hauyne, named after the mineralogist Haüy (q.v.), is a silicate of sodium and calcium combined with sulphates of the same metals:



It crystallises in the Cubic system, and is generally bright blue or greenish-blue, but sometimes reddish or greyish. The crystals usually contain fluid-cavities, gas-bubbles and microliths. They occur in such volcanic rocks as the phonolites, associated with nepheline and leucite.

Havana (SAN CRISTOBAL DE LA HABANA), the capital of Cuba, is on the north-western coast of the island. It was founded by Diego Velasquez in 1515, but originally stood four miles off on the opposite shore. It has suffered much at the hands of buccaneers, but after the seventeenth century, when it had become the centre of the Spanish West Indian trade, became more secure. It was

captured by the English in 1762, but redeemed at the peace. The modern part of the town lying to the west is well built, but the older part is made up in narrow and dirty streets. The cathedral, built of 1724, contains the bones of Columbus. Among the institutions are a hospital, which includes orphan and lunatic asylums and a poorhouse, and is called "Beneficencia;" a university, an arsenal, cadet and technical schools, and several theatres. Havana has a magnificent harbour defended by fortifications, and exports immense quantities of cigars and sugar, besides molasses, rum, and honey. The chief export trade is with the United States. Rice, flour, cod-fish, coal, are the chief imports. The place used to be known as "The Havannahs."

Havel, a navigable tributary of the Elbe, rises in a small lake in Mecklenburg, and flows in a southerly direction as far as Potsdam, where it turns west, and ultimately taking a northerly direction joins the Elbe a few miles south of Wittenberg. It has a total course of 220 miles.

Havelock, SIR HENRY (1795-1857), a gallant British officer, was the son of a Sunderland ship-builder. He was at the Charterhouse with Grote, Connop Thirlwall, and Julius Hare. He obtained in 1815 a commission in the 95th foot. In 1822 he exchanged into the 13th, in order to go to India, and a year after his arrival was appointed deputy-assistant-adjutant general to the army in Burmah. He published an account of the first Afghan War as he had done of the Burmese expedition. He was appointed Persian interpreter by Elphinstone, and accompanied Sir Robert Sale in the following campaign. He was next named deputy-adjutant-general by Pollock, and was made C.B. in 1842 for his services throughout the war. In the first Sikh War he was present at Mudki (where he had two horses shot under him), and also at Ferozeshah and Sobraon. In 1849 he went to England on sick leave, and returned two years later. In 1854 he was named quarter-master-general in India, and shortly after adjutant-general. He commanded a division under Outram in the Persian War. On the outbreak of the Mutiny he was sent to Allahabad in command of a division. From this city he set out to relieve Cawnpore, which he accomplished after defeating the Sepoys at Futtehpoore and Aong. He had marched 126 miles in the height of summer, and won four victories on the way. After providing for the health of the troops he next advanced to relieve Lucknow. On July 29 he won a victory at Onao, and on the same day stormed Busseerutgunge. He was compelled, however, to fall back, owing to the bad health of his troops and the want of ammunition, and to secure his retreat had to fight another battle. He was now superseded by Outram, who, however, determined to serve under him until the work of relieving Lucknow had been carried out. On arriving there on September 26th after much hard fighting, they could only reinforce the garrison, but were soon relieved by Sir Colin Campbell. Havelock was created K.C.B., but died on November 20th.

Havre (LE HAVRE DE NOTRE DAME DE GRÂCE), a French port situated in the department

of Seine-Inférieure, on the northern bank of the estuary of the Seine. It is 143 miles by railway from Paris. It owes its rise as the second commercial port in France to Francis I., who built and fortified the harbour. It was held by the troops of Elizabeth in 1562, and it was several times bombarded by the English in the wars of the succeeding centuries. The harbour is a very fine one, but is difficult of approach on account of the sandbanks lying off it. To meet this a plan was brought forward in 1889 for an outer harbour with a new entrance from deep water. Many emigrants sail annually from this port. Woollen and cotton goods, potatoes, eggs, silks, and butter, are among the chief exports, and wine and millinery in large quantities are sent out from it. The harbour dues are heavy. Ship-building is largely carried on, and there are also cannon-foundries, flour-mills, machine-factories, and dye-works. Among the chief buildings are the church of Notre Dame (16th century), a town-hall in the Renaissance style, and a museum. It has an important chamber of commerce, and hydrographical and commercial schools. Neither the sanitary nor the railway arrangements are very satisfactory; but it is much resorted to for sea-bathing.

Hawaii, or OWHYHEE, and eleven other islands (called the SANDWICH ISLANDS) constitute the state of Hawaii. They are situated in the Pacific Ocean, between lat. 19° and 22° N., and long. 155° and 160° W. The chief of the group are Hawaii, the largest and most southerly; Maui, Lanai, and Kahului, Molokai, Oahu, Kauai, and Niohau. The Sandwich Islands are said to have been discovered in 1542, but their first real connection with history dates from 1778, when Captain Cook came upon them in his voyage round the world. It was in Kealakekua Bay, on the western coast of Hawaii, that he was murdered in the very next year. The islands became one kingdom under Kamehameha I. at the end of the 18th century. Under the reign of his successor idolatry was abolished, and missionaries began to teach the people. Kamehameha II. and his queen died in England in 1824. In 1840 the next ruler granted a constitution, and three years later the independence of Hawaii was guaranteed by England and France. The death of its fifth king in 1873 brought to an end the Kamehameha dynasty. Lunalilo became king, but was succeeded next year by Kalakaua, who in 1887 granted a fresh constitution. In January, 1891, Liliuokalani became queen, but was dethroned two years later by a revolution provoked by her arbitrary government.

The total area of the islands is about that of Wales, Hawaii itself being 4,210 square miles.

The island of Hawaii is very mountainous, and contains two active volcanoes, Mauna Kea and Mauna Loa, each over 13,000 feet in height. In it also is Kilauea, the largest active volcano in the world; and in Maui is Holeakola with the largest crater, nearly 30 miles in circumference, and 3,000 feet in depth. The climate, considering the tropical situation of the archipelago, is temperate, the soil is generally poor, but in the beautiful

valleys are fertile tracts. Sugar and rice are grown, and on the Waimea plains in Hawaii large flocks of merino sheep find pasture. There is abundance of tropical fruits, and breeds of half-wild horses and dogs are among the animals. There are no minerals. Coral and rock and basalt are used for building purposes. None of the rivers are navigable, and there is very little rain except on the north-east coasts. Commercially, the Hawaiian islands, lying in the route between America, China, and Australia, are important. The greater part of the trade is the hands of the Americans, and in 1876 a reciprocity treaty was made with the United States. Manufactured goods are largely imported, and the chief exports are sugar, coffee, rice, and hides. Honolulu (by Oahu) has the only commodious harbour, but the roads are generally good, and telegraphs and railways are in use in the larger islands. Honolulu is lighted by electricity, and telephone communication has been established there. American coinage is in use. The expenditure exceeds the revenue, and the public debt is largely in English hands.

The natives are the northernmost branch of the large brown Polynesian race, and appear to have at some remote period reached the Sandwich Archipelago through the Marquesas group from Samoa. Hawaii is a dialectic form of Havaiki, which in the Marquesas is "the land of their forefathers," and which is a variant of Savaii, originally Savaiki, still the name of the chief island in the Samoan Archipelago. Like nearly all the East Polynesians, the Hawaiians are rapidly dying out, having diminished from about 200,000 at the time of Captain Cook's discovery (1778) to 34,500 in 1890. They are subject to the so-called mai-paké, a species of leprosy, all the victims of which are confined to a secluded valley in the island of Molokai, which seems destined ere long to become the grave of the race. They are being replaced by immigrants, chiefly from the Azores, China, and Japan, all of whom increase as steadily as the aborigines decay. The Hawaiians are all Christians, mostly Protestants, speaking or understanding English as well as their primitive Polynesian dialect, which is closely related to that of the Marquesas group. (Miss Bird, *The Hawaiian Archipelago*, 1878; Fernander, *Origin of the Polynesian Races*, 1885; Whitney, *Hawaiian Guide Book*, 1890.)

Hawâra, a historical Berber people, who at the time of the first Arab invasion (7th century) were spread over a great part of Mauritania, but are now represented only by the Hawâras of the Jebel Hawâra and other mountains about the head waters of the Shelif. Their power was completely broken by the Arabs, and the nation scattered in fragments all over North Africa as far as Upper Egypt and the Western Sahara, where the name still survives in the local geographical nomenclature.

Hawfinch (*Coccothraustes vulgaris*), a British finch, widely distributed in Europe and temperate Asia, and sometimes called the Common Grosbeak. The adult male is about six inches long; the plumage above is of various shades of brown, with a broad band of grey on the neck; the wings are

black, with the greater coverts white, and the under surface is vinous red.

Hawick, a town in Roxburghshire, Scotland, 52 miles S.S.E. of Edinburgh. The only traces of its antiquity are the Moat and a part of the Tower hotel, which was once a residence of the Douglasses of Drumlanrig, one of whom granted the town a charter, which was renewed by Queen Mary in 1545 and reformed by Act of Parliament in 1861. Hawick was burned by Lord Sussex when he invaded Scotland in 1570. The present buildings are all extremely modern, though a church which was rebuilt in 1763 dates back to the 13th century. The hosiery manufacture, begun in 1771, and the making of plaids and tweeds, set on foot about 1830, are the chief industries. Hawick unites with Selkirk and Galashiels to return one member of Parliament.

Hawk, a loose name for any raptorial bird that does not prey upon carrion, thus excluding the owls and vultures. It is properly confined to the Accipitrine genera, Accipiter [SPARROW-HAWK] and Astur [GOSHAWK], in which the bill bears no tooth.

Hawke, EDWARD HAWKE, first Lord Hawke, one of the greatest of English naval commanders, was born in 1705. He rose to the rank of commander in 1733, and to that of captain in the following year, and in 1747 became a rear-admiral. He was at once given command of a squadron which on October 14th, off Finisterre, met and crushingly defeated a French squadron. For this service he was made a K.B. In 1755 he took command in the Channel, but after the recall of Byng was transferred to the Mediterranean. In 1757, in which year he became an admiral, he was given command of the expedition to Rochefort, an expedition which failed owing to the military commander's lack of decision. Hawke, having brought the expedition home again, returned to blockade the French ports, and was able to effectually frustrate the dispatch of a squadron for the reinforcement of Louisbourg. In 1759 he won at Belleisle one of the most brilliant victories in the annals of history. Hawke on his return was awarded a pension of £2,000 a year. In 1762 he was made Rear-Admiral of England, in 1764 Vice-Admiral of England and First Lord of the Admiralty, and in 1768 Admiral of the Fleet, and in 1776 he was raised to the peerage. In 1781, after a career of extraordinary usefulness and honour, he died. He ranks with Nelson and Blake among the very first of British naval heroes.

Hawk-eagle, any bird of the genus Spizaëtus, with ten species from tropical and sub-tropical regions of both hemispheres. There is generally a well-developed crest.

Hawke Bay, a province in the northern island of New Zealand, on the eastern coast between Auckland and Wellington. The area is 4,765 square miles, and the population in 1886 was 24,568. It takes its name from Sir Edward Hawke (q.v.), who was at the head of the Admiralty when Cook

discovered it. There is much forest, but much farming also. Napier, a port, is the chief town.

Hawker, ROBERT STEPHEN (1803-75), a Cornish clergyman and poet, was the son of a Plymouth physician and grandson of a well-known vicar of that town. He was educated at Cheltenham and Pembroke College, Oxford, and before he went up married a rich lady. He won the Newdigate prize in 1827. Having been ordained in 1831, he was presented three years later to the vicarage of Morwenstow, on the north coast of Cornwall, where he passed the rest of his life. He married as his second wife a Polish lady, by whom he is thought to have been persuaded to enter the Roman Church. Of his poems, the best known, is the ballad *And Shall Trelawney Die?* which Macaulay quoted as a genuine work of the 17th century. His *Records of the Western Shore*, published in 1832, reappeared in 1840, with additions, in *Ecclesia*; and further additions were contained in *Echoes of Old Cornwall* (1846). *The Quest of the Sangreal* was published seven years before Tennyson's *Holy Grail*. In *Cornish Ballads* (1869) many of Hawker's early poems were reprinted. Biographies by Mr. Baring-Gould and the Rev. F. G. Lee have been published, and Hawker's friend, J. Godwin, edited his complete works in 1879.

Hawkers. Hawkers and pedlars are persons who carry their goods from place to place for inspection and sale. A licence duty is imposed upon them by the statute 50 Geo. III. c. 41, which also contains various provisions affecting their trade. After numerous amending acts the "Consolidated Hawkers Act, 1888," now regulates the business of hawkers, defining for the purposes of such Act a hawker as a person who *travels about with a horse or other beast bearing or drawing burden*. "The Pedlars Act, 1871," regulates the business of pedlars, a pedlar being therein defined as a person *travelling about without a horse, etc.* Pedlars are subject to control of the police, and are exempt from excise duty. By the Pedlars Act anyone over seventeen years of age, having resided a month in the district and being of good character, can obtain a yearly certificate on payment of a fee of 5s., and is thereupon entitled to exercise such calling in any part of the kingdom. Pedlars have an appeal from the police to the justices of the peace of the district. A hawker's licence costs £2 per annum, and it is granted like a pedlar's licence. He cannot sell spirits, but he may sell tea and coffee. If he deals in plate he must have a plate licence. Those selling goods in fairs or markets legally established do not require any licence.

Hawkesworth, JOHN (d. 1773), author of a book of *Voyages*, containing among others an account of the second and third voyages of Captain Cook, was born probably in 1715. He was early connected with the *Gentleman's Magazine*, and was associated with Johnson and others in starting *The Adventurer*, which was very successful. He also edited Swift's works (1754-55), and some of his *Letters*, adapted several plays for Garrick, translated *Télémaque*, and produced several original

plays which were popular in their day. He was intimate with Dr. Johnson in early life, and very successfully imitated his style, and his portrait was four times painted by Sir Joshua Reynolds. He is supposed to have put an end to his life by an over-dose of opium.

Hawkins (or, more properly, HAWKYNs), SIR JOHN, seaman and statesman, born in 1532 at Plymouth, made several trading and smuggling voyages to the Spanish Main, and narrowly escaped being caught and hanged there in 1568. In 1572 he entered Parliament for Plymouth, and in the following year was made Treasurer of the Navy. In that post he rendered most valuable services, and introduced many practical improvements of all kinds. In 1588 he commanded as a rear-admiral against the Spanish Armada, with his flag in the *Victory*, and for his valour was knighted by the commander-in-chief. In 1590, with Frobisher, he commanded an expedition to the coast of Portugal, and in 1595, with Drake, led another to the West Indies, but on November 12th in that year he died off Porto Rico. Hawkins, a man of undoubted genius, was the first of our naval reformers, and, but for him, the Armada would scarcely have found an English fleet worthy of the name in a condition even to observe its motions.

Hawkmoths, or SPHINGES, an important section of moths including five families. They have, as a rule, long pointed bodies which extend beyond the hind wings. They are often diurnal or fly by day, a habit which causes them to be confused with the butterflies; they also to some extent resemble butterflies by the antennæ having a thickened area just by the tip. Another character of the family is that the caterpillars usually have a horn just above the tail. The hawkmoths include a large number of species, and, owing to their diurnal habit and large size, include many of the best known of the moths. Thus it includes the famous Death's Head moth (q.v.), the largest of English lepidoptera. The most typical of the sphinges belong to the family *Sphingidæ*, of which the Privet Hawkmoth (*Sphinx ligustri*) is the most typical species. This is common in England; it has brown forewings, with black and pink hind wings. Another section of the group are the Elephant Hawkmoths (*Chærocampineæ*), so called owing to the possession by the caterpillars of a large trunk-like proboscis. The two best-known English species of this group are the large and small Elephant Hawkmoths (*Chærocampa elpenor* and *C. porcellus*). Another sub-family is that of the *Macroglossinæ*. The typical species is *Macroglossa stellatarum*—the Humming-Bird Hawkmoth, so known from its humming-bird-like flight, as they fly rapidly from flower to flower and suck the honey without alighting. The Bee Hawkmoth is a smaller member of the same group. The remaining families are of less importance but include many interesting genera; e.g. the Australian *Synemon* has definitely clubbed antennæ, and thus shows that the character most generally used to separate butterflies and moths is not universally correct.

Hawksbee (or HAUKSBEER), FRANCIS, a distinguished electrician, was born some time after 1650, and became a fellow of the Royal Society in 1705. Next year he invented the first electrical machine, and in 1709 published his *Physico-Mechanical Experiments*. He discovered the "lateral communication of motion in air," constructed an improved air-pump which bears his name, and determined the relative weight of water and air. He died after 1713. A supposed son of his, who died in 1763, is thought by De Morgan to have been the first to give lectures with experiments in London.

Hawkweeds, the popular name for the numerous and puzzlingly similar species of the genus *Hieracium*, belonging to the ligulifloral sub-order of the Compositæ, which have mostly yellow dandelion-like flowers, and are natives of the temperate region of the Old World. They have a brownish brittle sessile pappus. The name is said to be derived from the ancient belief that hawks used the milky juice of these plants to strengthen their sight. The ornamental orange-flowered *H. aurantiacum* is known as "Grim the Collier" from the black hairs on the involucre.

Hawse, the situation of a ship's cables before the stem, when a vessel is moored by the bows. Hence the space immediately ahead of a ship at anchor. Hawse-holes are the holes cut for the passage of the cables on each side of a ship's stem. They communicate with the forward part of the lower deck, with the quarters, that is, of the seamen; so that to say "he came into the service through the hawse-holes," is to say that he entered in the lowest capacity.

Hawser, a large rope or cable of three strands. [CABLE.] Strictly, in point of size, it holds an intermediate position between a cable and a tow-line, though the word is now very generally used in the latter sense. Hawser-laid rope is laid or twisted in the way opposite to that in which the individual strands are twisted. To ascertain its strength, square the circumference and divide by 3 for the breaking strain (in tons); by 4 for the proof strain; and by 6 for the working strain.

Hawthorn (*i.e.* hedgethorn, *white-thorn*, *quick-set* or *May*, *Crataegus Oxyacantha*), a shrub or small tree, sometimes 30 feet high, native to Europe, North Africa, and Western Asia, and naturalised in North America and Australia. It belongs to the sub-order Pomeæ of the order Rosaceæ. The wood is yellowish, hard and tough, but liable to warp; the bark smooth and blackish, the branches numerous with spinously aborted twigs, the leaves scattered, cuneate, irregularly-lobed and long-stalked. The sweet-scented flowers, white, or more rarely pink or scarlet, are in corymbs; and the fruit or "haw" is a small, nearly globular, berry-like, red pome, with mealy flesh, a stony core, small withered calyx and 1 to 3 styles. Hawthorn branches are said to have been sacred among the Greeks to Hymen; but, being popularly supposed to be the source of Christ's crown of thorns, it has been considered unlucky. The

variety *præcox*, flowering in January as well as in May, is known as the Glastonbury thorn, legendarily derived from the staff of St. Joseph of Arimathea. The tree has from very early times been set as a live or "quick" hedge. Its wood has been used for cogs, and, though seldom obtained in large pieces, is the nearest approach to a substitute for box for engraving. The leaves have been used instead of tea. The plant is the badge of the Ogilvies.

Hawthorne, NATHANIEL (1804-64), was born of a good New England family at Salem, Massachusetts. He was at Bowdoin College in Maine with Longfellow and Pierce, and very early began to note down his impressions. Though from the first he had made up his mind to become a man of letters, it was long before he made any way. *Fanshawe*, his first novel, published in 1828, failed. In the same year he became associated with Goodrich ("Peter Parley"), to whose periodical, *The Token*, he contributed, and for whom he edited several publications. The appreciation shown in England of *Twice-Told Tales*, which also won the approval of Longfellow, gave Hawthorne, in 1837, his first real recognition. Pecuniary success was still, however, wanting, and for two years the young author found it useful to fulfil the duties of weigher and gauger at Boston, the collector there being Bancroft the historian. Being deprived of this by the accession of the Whig party to power, he now went to live with George William Curtis, Margaret Fuller, and others in a community at Brook Farm (q.v.), the organiser of which was Dr. George Ripley. After living with them some months, Hawthorne married Sophia Peabody, and went to live in the old manse near Concord which he has immortalised. Here he remained four years, contributing to the *Democratic Review*, and living a very retired life. In *Mosses from an Old Manse* (1846) he has described the house and its surroundings, and has recorded the effect produced on his mind by its historical associations. From 1846 to 1850 he was again in the employment of the State, this time in the capacity of surveyor of customs at Salem. In his leisure hours he prepared materials for *The Scarlet Letter*, his masterpiece, which appeared in 1850, and effectually established its author's reputation. Thus encouraged he entered upon the period of his greatest activity, producing in 1851 *The House of the Seven Gables*, and in 1852 *The Snow Image* and *The Blithedale Romance*, the last being reminiscent of his experiences at Brook Farm. He also wrote a children's book, *The Wonder Book*, and afterwards, as a continuation, *Tanglewood Tales*. He was, moreover, induced to write a biography of his friend Franklin Pierce, who, at the end of 1852, was the successful Democratic candidate for the Presidency. Hawthorne had declared that he would accept no office if his friend were elected, but he was ultimately persuaded to accept the position of consul at Liverpool, where he remained from 1853 to 1857. He then visited France and Italy, and published in 1860 *The Marble Faun*, written while staying in Yorkshire. After his return to America he wrote some papers for the *Atlantic Monthly*, which were published in 1863 in

book-form as *Our Old Home*. This was his last completed work, and he died at Plymouth in New Hampshire, whither he had gone with ex-President Pierce early in 1864. He was buried at Concord. Two versions of the romance he had left in MSS. subsequently appeared: the one under the title *Septimius Felton*, under the editorship of his elder daughter with the assistance of Browning; the other, called *Dr. Grimshaw's Secret*, was prepared by his son Julian. Hawthorne is not only the first of American novelists; he is also one of the first stylists of the Anglo-Saxon race. His son, JULIAN, born at Boston in 1846, though a clever writer, has inherited but a small portion of his father's power. After finishing his education at Harvard, he passed some years as an engineer at Dresden, but finally became a novelist. *Garter*, *Sebastian Strome*, and *Dust* are the names of some of his chief works. From 1875 to 1881 he lived in England.

Hay ("cut grass," cognate with the verb *to hew*), grasses and other plants cut and dried as fodder (q.v.). In England the hay-harvest is, under favourable conditions, completed by the end of June or early in July. The crop, which usually consists of natural grasses, sometimes amounts to two tons per acre. The grass should be cut before it runs to seed, as the moister it is the better hay it is likely to produce. In order to preserve its quality after it has been cut, it must be repeatedly turned and dried as speedily as possible. For the latter purpose artificial means are employed when practicable. The common method of drying hay is to shake it and spread it over the field by means of forks or tedding-machines, and after it has remained thus during the day to collect it into windrows or haycocks before nightfall. This process is repeated for two or three days or longer, after which the hay is stacked in ricks. Injury to the hay commonly arises either from stacking it before the natural moisture has been sufficiently removed, in which case it becomes over-heated, or from putting it together when it is wet with rain or dew, which tends to render it mouldy. The latter evil is sometimes remedied by mixing a little salt with the hay. In Scotland clover and ryegrass are usually grown for hay, instead of natural grasses.

Haydn, FRANZ JOSEF (1732-1809), the great Austrian composer, was the son of a wheelwright, and was born at Rohrau, a village on the borders of Lower Austria and Hungary. He underwent a severe early training in singing and instrumentation from a relative named Frankl, and finished his education as a chorister at Stephen's Cantorei in Vienna. After being dismissed for a practical joke from St. Stephens, Josef took pupils and studied the compositions of Emmanuel Bach. Having become acquainted with Porpora, he acted for a time as his accompanist, and received a few lessons from him; but it was Fùrnberg who directed his attention to the composition of quartets, and he also it was who recommended him to Count Morzin as musical director. For the latter in 1759 he composed his first symphony. When with him at Lukavec he contracted his

unfortunate marriage. In 1761 Haydn was first employed by the Esterhazys, and five years later became sole kapellmeister to Prince Nicolaus, a passionate lover of music. In this year the *Wiener Diarium* wrote of Haydn as the "favourite of our nation." In 1775 his oratorio *Il Ritorno di Tobia* was given in Vienna. *Ritter Rolland* (*Orlando Paladina*) was composed in 1782, and *Armida* in 1783. The best of his masses were composed in 1782 and between 1796 and 1805. Early next year Haydn accompanied Salomons to London, where his company was much sought after. Six of the symphonies were performed at the Hanover Square Rooms. On his way back to Vienna he had an interview with Beethoven at Bonn, and the latter soon after took lessons from him. In 1794 Haydn paid a second visit to London, where he composed and conducted six symphonies for Salomons, the *Surprise* being frequently given. He was now again engaged by a Prince Esterhazy. In 1797 he composed the *Emperor's Hymn*, and he reached the culminating point of his career when the *Creation* (1798) and *The Seasons* (1799) were produced. Haydn must be considered the father of instrumental music. His masses are still much used in Catholic churches. Among his pupils were the Webers. His title of "Papa Haydn" is an indication of the universal feeling of veneration entertained for him.

Haydon, BENJAMIN ROBERT (1786-1846), an eminent but unfortunate historical painter, was the son of a printer and publisher at Plymouth. His artistic tastes were encouraged by Dr. Bidlake, the grammar-school master, and he afterwards acquired a good general education at Plympton. He was for awhile his father's apprentice, but in 1804 started for London to make his fortune as an artist. He attended the Academy schools and anatomical lectures, and became acquainted with Wilkie, Prince Hoare, and Fuseli. In 1807 his *Joseph and Mary* was hung on the line at the Royal Academy, and was afterwards bought for 100 guineas. His *Dentatus*, inspired by the Elgin marbles (which he was the first Englishman to appreciate), was badly hung in 1809. *Macbeth* was next executed for Sir George Beaumont, but the artist was unable to obtain election to the Academy, which, in 1812, he attacked in the pages of the *Examiner*. Two years later his *Judgment of Solomon* created a sensation at the Spring Gardens Water Colour Exhibition, and was sold for a large sum. Haydon received the freedom of his native town, where, as well as at Liverpool and Birmingham, the above-mentioned picture was exhibited, though with little profit. *Christ's Entry into Jerusalem* occupied him six years, but left him penniless at its completion. His next picture, *Lazarus*, was seized by his creditors, and sold for £30, and he had to go to prison. In 1835 he began to lecture, and this form of work afforded him much relief. His last years were embittered by his not obtaining a commission to decorate the walls of the Houses of Parliament and by the failure of an exhibition at the Egyptian Hall; and in despair he shot himself.

Hayes, RUTHERFORD BIRCHARD (1822-93), 19th President of the United States of America, was born at Delaware, Ohio, where his father was a merchant. He was educated at Ohio and Harvard, and having been called to the Ohio bar practised at Cincinnati till 1861. He served as a volunteer in the Federal army during the war, and rose to the rank of major-general. He was first returned to Congress for Ohio in 1865, of which state he became governor two years later, and again in 1869 and 1875 held the same position. In 1876 he was Republican candidate for the Presidency, but was returned only by very questionable procedure. There were double returns in Louisiana, Florida, and Oregon, and an Electoral Commission, in which the Republicans had a majority, decided by one vote only that the Republican set was genuine. The chief events of Hayes's presidency were an attempted reform of the Civil Service, which was thwarted by the opposition of his supporter Conkling; the withdrawal of troops from the Southern States, and his conflict with Congress on the silver question, the Monetisation Bill being carried against his veto in 1878. After his retirement from office he took little further part in public life.

Hay Fever, a peculiar disease, the prominent feature of which is nasal catarrh. Its attacks are confined to certain subjects who from some peculiarity of constitution are susceptible to the disease. In them it recurs year after year, usually during the month of June, and the patients are quite free from the disease at other seasons. Hay fever is said to be produced by the pollen of grasses while floating in the air during the early summer months irritates the mucous membranes of those who are subject to the malady. Some alleviation may be procured by the use of tonics or by the change of air, but the disease is a peculiarly intractable one.

Haynau, JULIUS BARON VON (1786-1853), an Austrian general, whose name became notorious, was born at Cassel. For his severities in the campaign of 1848-49 in Italy he gained the name of the "Hyæna of Brescia," and in crushing the Hungarian rising which followed, showed equal ruthlessness. He entered the Austrian service in 1801, and became field-marshal in 1844. In spite of his distinguished services in the Hungarian war, when he stormed Raab and won several battles on the Meiss, he was dismissed the service for "intractability" in 1850. He then travelled, and during a visit to London was assaulted at the brewery of Barclay and Perkins. He denied the charges of flogging women, and a biography by Baron Schönhals attempted a general defence of his character.

Hayti (HAÏTI), or SAN DOMINGO, a large West Indian island, lying to the south-east of Cuba and east of Jamaica. It is divided into Hayti, the western and smaller part of the island, and the republic of San Domingo or "Dominican Republic" (not to be confused with Dominica, q.v.), the larger eastern portion. Discovered by

Columbus in 1492, its history has probably been more troublous than that of any country in the world. The Spaniards soon almost exterminated the original inhabitants, and African negroes, first introduced in 1505, or their mulatto offspring, form a very large section of the population. French buccaneers soon after came from the island of Tortuga to Hayti, and settled chiefly in the western half of the island. This portion was ceded to France by the Treaty of Ryswick (1697). There were thus three races: the whites, the blacks, and the mulattoes. The last of these were free, but enjoyed no political power, till in 1791 a bitter race struggle broke out, which ended in the extermination of the Europeans. A French expedition defeated and captured the coloured leader Toussaint l'Ouverture (q.v.) in 1801, but France was unable to maintain her hold upon the island, and in 1804 Dessalines took the title of Emperor of Hayti. Revolution now followed revolution, the island being sometimes one, sometimes divided; the government, at one time monarchical, at another republican. For a time there was peace under the rule of President Boyes, who governed the whole island from 1822-43; and the independence of Hayti proper was acknowledged by France in 1825 in consideration of pecuniary compensation to the planters. In 1843 the Dominican Republic was formed; but in Hayti, Sonlouque in 1849 assumed the title of emperor. Ten years later, however, a republic was proclaimed. In 1867 it was enacted that a president should hold office for four years, but this he has seldom been able to do. In 1889 Hippolyte drove President Légitime from the island and took his place. The government and the state of society of Hayti may be described as the worst in the world. The religion is nominally Christian, but serpent worship and cannibalism are by no means unknown. The area of the whole island is 29,830 square miles, and of Hayti 9,242. The soil of Hayti is fertile, but is badly cultivated. Cotton, rice, yams, tobacco, maize, cocoa, and several fruits are among the natural products; and mango, sugar, coffee, and indigo are grown. Mahogany, satinwood, and rosewood are obtained from the forests. The island is mountainous, as its name betokens; the highest peak, Lorna Tina, is over 10,000 feet high. Earthquakes are frequent, but there are no volcanoes. The rivers are unimportant, but there is a large salt lake, Euriquillo, near the centre of the southern coast. There are heavy rains in May and June, and hurricanes are not infrequent.

The commercial state of the republic of Hayti is naturally not prosperous. The chief exports are coffee, cocoa, cotton, logwood, and mahogany; the imports come chiefly from the United States. There is a large floating debt, and the army and navy are insignificant, while the public service is corrupt. The estimates of revenue and expenditure are generally held to be valueless. The language (in Hayti proper) is a corrupt French. Port-au-Prince is the chief town in Hayti. The Bay of Gonaives contains excellent harbours; in it is the island of Gonaives belonging to the republic. To the north is Tortuga, also attached to Hayti. An

interesting description of the country by Sir Spenser St. John, formerly Consul-General (*Hayti; or, the Black Republic*), was published in 1884.

Hayward, ABRAHAM (1801–84), a well-known essayist, born in Somersetshire, was called to the bar in 1832, and became Q.C. in 1845. He founded and edited the *Law Magazine*, but distinguished himself rather as a man of letters than as a lawyer. He translated the first part of *Faust* (1833), and wrote much for the *Quarterly Review* and other periodicals and newspapers, the best of his articles being republished in three series of *Biographical and Critical Essays* and in *Sketches of Eminent Statesmen and Writers*. He was a great favourite in society, and published works on *The Art of Dining*, and the rules of whist. He also edited *The Autobiography of Mrs. Piozzi*. His *Select Correspondence* appeared in two volumes in 1886.

Hazâras, the inhabitants of the mountainous region of North Afghanistan between Kabul and Herat, who are undoubtedly of Mongolo-Tartar origin, though now speaking a mediæval form of Persian and belonging to the Siah or Persian division of the Mohammedan religion. They are called Moghel, *i.e.* Moghuls, by their Ghilzai neighbours, and their Mongol descent is clearly shown in their Kalmuck features, small oblique eyes, high cheek-bones, flat beardless face, and long black hair. Some claim descent from the Koreish Arabs, others from the Toghiani Turks, and others, with more probability, from a number of Mongol families left in this region by Jenghiz Khan, who were afterwards joined by others in the time of Timur Beg (Tamerlane). The national name *Hazâra*, meaning “a thousand,” probably has reference to the innumerable tribal groups into which they are divided, and each of which is governed by its own chief, either a sultan, a khan, a beg, a vali, a mir, or a mehtar, while all recognise the suzerainty of the Ser Khanah (“Head of the House”), who in his turn is dependent on the Amir of Afghanistan. These chiefs, however, are often at war with each other, and seldom combine except to resist the Amir’s tax-gatherers or to join in a plundering expedition against some powerful neighbour. The Hazâras allow a large share of freedom to their women, who generally control the domestic relations, take part in the tribal assemblies, and even join in the raids mounted on horseback. South of the Hazâras dwell the kindred Eimaks, from whom they differ little except that the former are violent Shiahs, the latter rigid Sannis. (C. M. Macgregor, *Afghanistan*, p. 246.)

Hazel (*Corylus Avellana*), a shrub or small tree belonging to the order Corylaceæ and native of Europe, North Africa, and Western Asia. Its wood is reddish, close-grained and flexible; the bark, a mottled bright brown; the twigs pubescent; the leaves scattered, short-stalked, irregularly serrate, downy and roundish, turning yellow in autumn. The flowers are monœcious and precocious, occurring, that is, before the leaves in February or March—the male in pendulous yellow catkins and the female in small oval sessile, ascending catkins

with crimson stigmas. The bracteoles unite to form the leafy *cupule* or husk to the nut, which in the filbert (*q.v.*) is enclosed by it. A variety (*purpurea*) has handsome bronze-purple foliage. The wood makes excellent crayon and gunpowder charcoal, and the coppice-shoots are used for hurdles, hoops, hampers, and walking-sticks. A hazel wand is generally used as a divining-rod, and the name is said to be derived from its being the primitive royal sceptre. The American *Hawaucelis virginica*, from which Pond’s Extract is prepared, is sometimes known as witch-hazel. The hazel is the badge of the clan Colquhoun.

Hazlitt, WILLIAM (1778–1830), one of the best English critics, was born at Maidstone, where his father was a Unitarian minister. He was educated for the ministry of that denomination, but early abandoned the notion of entering it. His Unitarian connection, however, gained for him the acquaintance of Coleridge, in whose company he also met Wordsworth in 1799. For a few years he devoted his time to painting, and his portrait of *Laub as a Venetian Senator* is in the National Portrait Gallery; but he soon abandoned art for his true vocation as a man of letters. He had, indeed, so early as his fourteenth year, contributed to a paper, and in 1806 was published his *Principles of Human Action*. In 1812 he settled in London, living in a house in Westminster belonging to Jeremy Bentham. He soon became connected with the *Morning Chronicle*, and afterwards with Leigh Hunt’s *Examiner*, for which, with Hunt, he wrote the series of essays called *The Round Table*. He also occasionally contributed to the *Edinburgh Review*. As a lecturer he was very successful, his lectures on the English comic writers, on the English poets, and on the dramatic literature of the reign of Elizabeth, all of which were published, being his best efforts. Most of his essays first appeared in the *London Magazine* and Colburn’s *New Monthly*, including those afterwards contained in *Table Talk* and *The Plain Speaker*. His *Characteristics* (1823–27) were an imitation of Rochefoucauld. The *Characters of Shakespeare’s Plays* was Hazlitt’s most popular work, but probably his *Review of the English Stage* was the most valuable. The *Life of Napoleon* showed him at his worst. Hazlitt, though his reading was not wide and included no Greek or German authors, was a versatile as well as an acute writer. His political opinions seem to have been chiefly negative, but he was virulently attacked by the Tory writers, and in one instance, at least—his letter to Gifford, the editor of the *Quarterly Review*—he replied with triumphant bitterness.

Head, in *Hydraulics*, signifies difference of level. A head of water causes flow, if a suitable conductor for the water exists between the points concerned. [HYDRAULICS.]

Head, SIR EDMUND WALKER (1805–68), an able Colonial governor, was the son of an Essex clergyman. He was educated at Winchester and Oxford, where he held a fellowship of Merton for seven years. In 1841 he was made a Poor Law

Commissioner, and an article by him on *Settlement* in the *Edinburgh Review* was circulated as a reprint by Government authority. From 1847 to 1854 he was Governor of New Brunswick, and from the latter year till 1861 was Governor-General of Canada. After retiring from this post, he became a Civil Service Commissioner. He was an intimate friend of Sir G. C. Lewis (q.v.), whose *Essays on the Administrations of Great Britain* he edited, and was also an accomplished linguist.

Head, SIR FRANCIS BOND (1793-1875), a Colonial statesman entirely unconnected with Sir Edmund, was born at Higham, and, having received a military education, entered the army, and was present at Waterloo. In 1825 he retired on half-pay, to become manager of the Rio Plata Mining Association, but the enterprise was unsuccessful. Ten years later he accepted the appointment of Lieutenant-Governor of Upper Canada, which he administered with great ability, and in 1837 put down an insurrection. On returning home he wrote a good deal for the *Quarterly Review*, where he published his narrative of affairs in Canada. He was created a baronet in 1836, and a Privy Councillor in 1867. In *The Emigrant* he gave an account of his return from Canada, when his life was in danger; and he also published *Bubbles from the Brunnen of Nassau, by an Old Man, a Life of Bruce* (the traveller), and a description of his life in South America.

Headache is a symptom met with in many forms of disease. It occurs in various kinds of intercranial mischief; it is a distressing symptom in most species of fever; it occurs in Bright's disease, in anæmia, in various uterine conditions in women, and in association with disturbances of the digestive system (the common bilious headache). A variety of headache recurring at intervals and sometimes involving only one side of the head is known as hemicrania or megrim. [MEGRIM.] Lastly, headache sometimes occurs apart from other symptoms, as the result of worry and overwork of the brain. The term headache is not applied to every form of pain in the head; it must be distinguished from neuralgia of the nerves of the scalp, from the pain of ear disease, of glaucoma, and from the pains of inflammation of the bones of the skull. In children who complain of headache it will not infrequently be found that the eyes are at fault, and many a headache occurring in young persons has been cured by prescribing a suitable pair of glasses.

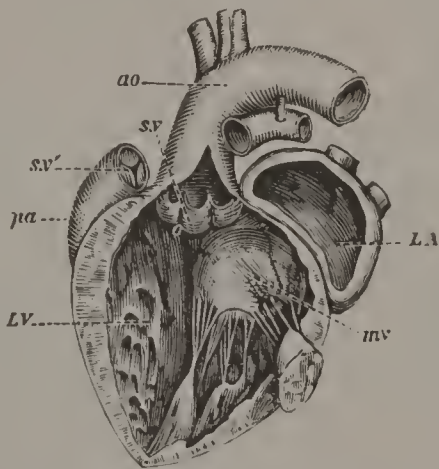
Head Injuries. An injury to the head is always a matter for serious consideration, and, however slight the mischief may at first sight appear, the possible complications which may supervene should render it imperative that the most careful precautions are taken. Injuries of the head may be divided into simple contusions, wounds of the scalp, extravasation of blood within the cranial cavity, fracture of the skull, injury to the brain or its membranes and nerve lesions. Various complications of head injuries are met with. Erysipelas is the commonest of these. In

severe injury inflammation, leading to the formation of matter within the skull, may occur, and in rare instances a portion of brain substance may protrude through a wound in the bony case of the skull, a condition which is known as hernia cerebri. Fracture may involve the vertex or the base of the skull. A characteristic symptom of fracture of the base is the escape of blood or cerebro-spinal fluid from the meatus of the ear. Injuries of the brain itself have been discussed under CONCUSSION. In certain head injuries it is sometimes necessary to perform the operation of trephining the skull.

Headon Beds, a subdivision of the Oligocene (q.v.) of the Isle of Wight, so named by Edward Forbes, which vary in thickness from 133 feet at Headon Hill to 175 feet at Whitecliff Bay. They consist of green shelly sands and marls or limestones, mainly of fresh-water origin, but with some brackish and marine beds in the middle of the series. They rest conformably upon the Upper Bagshot Sands, and are similarly overlaid by the Osborne series. Among the most characteristic fossils are *Planorbis cuomphalus*, *Lymnæa caudata*, and *L. longiseata*, and *Viriparus lenta* in the fresh-water beds, *Potamides cinctus* in the brackish ones, and *Cytherea (Venus) incrassata* and *Neritina concava* in the marine ones. At Hordwell or Hordle Cliff, near Lymington, the lower part of the series has yielded turtles, snakes, an alligator, a crocodile, the fresh-water bony-pike *Lepidosteus*, several birds, the ungulates *Palæotherium* and *Anoplotherium*, the insectivorous *Spalacodon*, and the carnivor *Hyænodon*. At Brockenhurst the marine Middle Headon series has yielded numerous fossils, including fourteen species of corals.

Heart. The human heart lies enclosed in a serous sac, the pericardium, in the cavity of the chest between the two lungs; its base, from which the large blood-vessels conveying blood from and to it take origin, is situated behind the *sternum* or breastbone. At the level of the second intercostal space, its apex impinges against the external wall of the chest at a point situated on the fifth intercostal space, a little internal to a line drawn vertically downwards through the nipple. The heart contains four chambers, two auricles and two ventricles. Looking at it from the front, portions of the muscular wall bounding each of these chambers are visible, the right auricle lying above and to the right, the left auricle above and to the left, the right ventricle and left ventricle being situated beneath the auricles on the right and left sides respectively. Furthermore, however, it should be mentioned that the right ventricle lies, broadly speaking, in front of the left ventricle, so that from the anterior aspect a large portion of the wall of the right ventricle is seen, while the wall of the left ventricle appears only at the extreme left border of the portion of the heart that is visible. The edges of the lungs overlap the anterior aspect of the heart on each side, leaving only a small portion of cardiac muscle uncovered by lung. It is this uncovered portion of the heart which gives rise to what is known as the area of *cardiac dulness*. On percussion of the chest wall, in situations beneath

which lie resonant lung substance, a different note is obtained to that which results when the chest overlying the non-resonant heart substance is percussed. In this way a dull sound obtains where the heart is uncovered by lung, over a triangular area in front of the chest, the area of cardiac dullness. The large veins conveying blood from the head and upper extremities (superior vena cava) and from the trunk and lower extremities (inferior vena cava) empty themselves into the right auricle, and from the right auricle, the natural direction of the blood current, into the right ventricle through an aperture, the *auriculo-ventricular opening*, which is guarded by a valve called the *tricuspid* valve. From the base of the right ventricle the pulmonary artery takes origin and conveys the blood squeezed out of the contracting ventricle to the lungs. After undergoing aëration in the lungs, the blood is returned to the left auricle of the heart by the pulmonary veins; it then passes through the left *auriculo-ventricular opening*, which is guarded by the bicuspid or mitral valve into the left ventricle and from thence is discharged, when that ventricle contracts, into the aorta, and so to the several arteries of the body. At the origins of the pulmonary artery and aorta there are the two sets of semilunar valves, three in each vessel. These valves offer no opposition to the flow of blood from the ventricles into the pulmonary artery and aorta respectively; but the semilunar folds become closely apposed and prevent any back flow of blood from the two great arterial trunks into the ventricles. In the same way the auriculo-ventricular valves (tricuspid and mitral) offer no obstacle to the flow from the auricles to the ventricles, but when the latter cavities become filled the valves are floated up, their cusps come into close apposition with one another, and form a barrier which prevents any back flow from the ventricles into the auricles. The delicate membranes or cusps of the auriculo-ventricular valves are attached at their bases to the

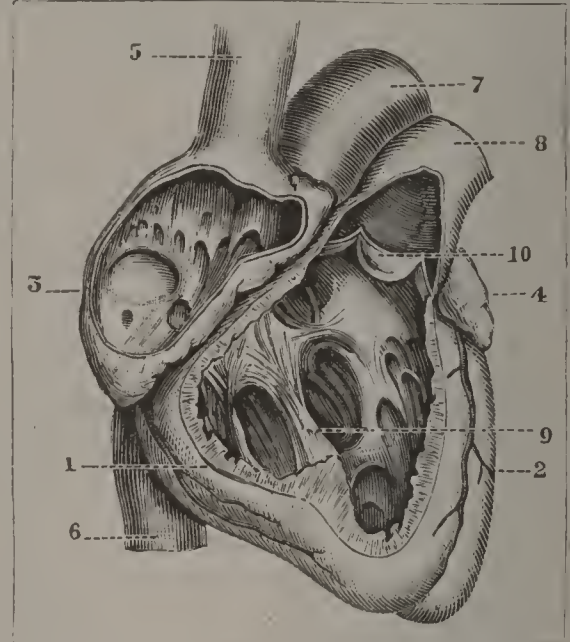


SECTION OF HUMAN HEART (LEFT SIDE).

LV, Left ventricle; LA, left auricle; mv, mitral valve; pa, pulmonary artery; sv, semilunar valves of pulmonary artery; ao, aorta; sv', semilunar valves of aorta.

heart wall at the junction of the auricles and ventricles. From the under surfaces of the valve membrane spring a number of fine cords (*chordæ tendinæ*) which communicate through small muscular columns (*musculi papillares*) with the walls

of the ventricles. This arrangement of *chordæ tendinæ musculi papillares* contributes to maintain the effectiveness of the barrier formed by the valve cusps between ventricle and auricle, when the ventricles become full, by preventing the eversion of the flaps of valve membrane into the auricular



SECTION OF HUMAN HEART (RIGHT SIDE).

1 Right ventricle; 2 left ventricle; 3 right auricle; 4 part of left auricle; 5 superior vena cava; 6 inferior vena cava; 7 aorta; 8 pulmonary artery; 9 muscular column and tendinous cords (attached to the tricuspid valve); 10 semilunar valves.

cavity. The heart beats about seventy-two times a minute, and the several events corresponding to each beat occur in a certain sequence and constitute what is termed the *cardiac cycle*.

These events comprise the alternate contraction (*systole*) and relaxation (*diastole*) of the auricles and ventricles. Commencing with the auricular systole, which is sharp and sudden and expels the blood from the right auricle into the right ventricle, and from the left auricle into the left ventricle respectively, the next and immediately succeeding event is the ventricular systole, which drives the blood contained in the right ventricle into the pulmonary artery, and that contained in the left ventricle into the aorta. While the ventricles are contracting, the auricles are passively dilating, that is, they have entered upon their period of diastole, and as soon as the ventricular contraction is over the ventricles too are in diastole, and thus for a brief space the muscular tissue of all four cavities is in a state of quiescence. This period is known as the heart's pause, and completes the cycle of events. Each series comprising auricular systole, ventricular systole, and pause is repeated, as already stated, about seventy-two times a minute, small as the space of time is, occupied by the several events in a cardiac cycle, it has been found possible to determine with considerable accuracy the duration of each event. Roughly speaking, if a cycle be divided into five parts, less than one of them will be occupied by the contraction of the auricles, about two parts by the contraction of the ventricles, and rather more than

two parts by the pause. On listening over the heart region two sounds occurring in quick succession, followed by a period of silence, are observed in correspondence with each cardiac cycle. A dull first sound, a short and sharp second sound, and then the afore-mentioned interval. This series of events may be represented by the sequence "lubb dūp—" repeated about seventy-two times a minute. The impulse of the heart (apex beat) can be felt in the situation already alluded to, and if its time of occurrence be compared with that of the sounds heard, it will be found to take place just at the moment when the first sound is heard. The first sound is probably in part a muscular sound produced by the contraction of the muscular fibres of the heart, and in part due to the vibration of the apparatus of the auriculo-ventricular valves, put on the stretch as the cusps float up and prevent the escape of the blood from the ventricles into the auricles. The second sound is, no doubt, due to the sudden closure of the semi-lunar valves as they come into apposition and prevent any back-flow from the arteries into the ventricles. The natural heart sounds undergo alteration, and may be quite obscured and replaced by abnormal sounds known as *bruits* or *murmurs* in diseased conditions of the valves. Thus it is customary to speak of *aortic murmurs*, *mitral murmurs*, and the like. By careful study of the exact point in the cardiac cycle at which such an abnormal sound occurs, and by carefully noting the situation on the external chest wall in which each sound is best heard, and the direction in which it appears to be propagated, much has been learnt with respect to valvular disease.

Diseases of the Heart. Various inflammatory conditions affect the heart. The outer serous coating, pericardium, is apt to be involved in the course of acute rheumatism, in pyæmia, etc. This condition, *pericarditis*, is at all times a serious one, and may lead to grave embarrassment of the heart's action. If the muscular substance itself undergoes inflammation, the term *myocarditis* is applied to the disease. Finally, the internal lining membrane of the heart, the endocardium, is particularly liable to become inflamed, and when this is the case *endocarditis* is said to exist. In endocarditis the valves are more prone to suffer than is any other portion of the internal lining of the heart, and curiously enough the valves of the left side of the heart are much more commonly attacked than those of the right side. Acute rheumatism (rheumatic fever) is the usual exciting cause of valvular disease, and as the result of the inflammation which occurs in rheumatic endocarditis minute granulations of effused lymph are formed, mainly in the situations where the flaps of the valves come into contact, and scar tissue is subsequently developed and considerable deformity of structure may result. The aortic and mitral valves in this way not uncommonly become so altered in shape as to materially impair their effective action. They may be so thickened and unyielding as to offer considerable resistance to the flow of blood through them (aortic obstruction and mitral obstruction), and, on the other hand, the failure of their surfaces

to become accurately apposed to one another when the valve shuts may lead to a back-flow of blood (aortic regurgitation and mitral regurgitation). The degenerative change known as atheroma is also productive of alteration in the valves, particularly in the aortic valves. Each form of valvular disease is associated with characteristic morbid sounds (*bruits*), and these readily guide the physician to his diagnosis of the particular condition which obtains. The heart makes a considerable effort to deal with any valvular defect which may exist, and excess of work being thrown upon one or other chambers of the heart an attempt is made to obviate the difficulty by overgrowth of the muscular tissue of the chamber or chambers involved. In this way *hypertrophy* of the heart results, and in some instances the organ may continue for many years to struggle with adverse circumstances, and a condition of compensation is said to exist. In many instances, however, the natural effort is not able to keep pace with the disorganisation of the mechanism produced by the valvular disease. There is more and more difficulty in maintaining the circulation, the chambers of the heart, particularly of the right side, become dilated, and the obstruction makes itself manifest in dropsical condition of the extremities, or may be in engorgement of the lungs. A particular form of endocarditis, acute ulcerative endocarditis, sometimes occurs. This disease, which usually proves fatal, has been much studied of recent years from the bacteriological standpoint. Altogether apart from valvular disease, the heart muscle is liable to become hypertrophied in certain forms of Bright's disease, particularly in that condition which is known as *chronic interstitial nephritis*. The muscular walls of the heart are also liable to certain degenerative processes. Of these the most important is that known as *fatty degeneration*. Lastly the subject of *congenital* disease of the heart should be mentioned. The heart in such a case is malformed from birth, a common defect being a constriction of the orifice of the pulmonary artery with imperfect development of the *septum* or partition between the two ventricles. A striking symptom which accompanies this condition is *cyanosis*, that is lividity due to imperfect aëration of the blood.

Heartburn. [INDIGESTION.]

Heartsease and **Pansy**, the best known of the many popular names for the cultivated forms of *Viola tricolor*, a very variable and mainly European species of violet, with large spreading pinnatifid leafy stipules to its long-stalked leaves, and flowers varying much in colour and size, but never cleistogamous (q.v.), as in most other violets.

Heart Urchins, a general name to include the sea urchins of the order Spatangoidea (q.v.). These have the mouth on the lower side, and, as a rule, some distance from the centre toward the anterior margin. The mouth, as a rule, is oval, and has two lips, and is not surrounded by a floscelle as in the allied order the Cassiduloidea. The anus is either also on the lower side or on the posterior

margin. The best-known member of the group is the common Heart Urchin (*Spatangus purpureus*, *O.F.M.*), common on some parts of the English coast. Some well-known chalk fossils, such as *Furciaster coranguinum*, also belong to this series.

Heat is now regarded as a special kind of motion of the particles of any material substance, whether solid, liquid, or gaseous. We are able to distinguish this kind of motion by our sense of touch, not by the sense of sight or of hearing; though it is not inconceivable that beings may exist whose sight or hearing are sufficiently refined to perceive with their eyes the existence of heat in a body. Ordinary beings, for example, can recognise that a tuning-fork is vibrating, by applying it either to their ears or to their teeth. All invisible molecular motions can be regarded as heat, and it must be understood that heat-motion can be transformed into other invisible motion, and so cause an apparently entire disappearance of heat. When thus transformed, it is called *latent*, but the term is obviously incorrect, and was, in fact, given when totally erroneous impressions of the nature of heat were held by physicists. [CALORIC.] The various elementary facts concerning heat in its many applications are described in separate articles, and need not here be repeated. When a body is in motion it is said to have kinetic energy. A body containing heat, therefore, possesses energy, and it is usual to define heat as a form of energy and to measure it in the same way. The principle of conservation of energy states that it can never be destroyed though it may be transformed. [CONSERVATION OF ENERGY.] So if heat is given to a body, and does not manifest itself in an intensification of those properties that we know by experience to be due to the heat of the body, we infer that it possesses energy in some other form, and that, by suitable means, we may get the energy back either as heat or as some other manifestation. Intensification of heat motion shows itself in what is called a rise in temperature (q.v.), which may conveniently be defined as heat intensity. A subtraction of heat from any body causes a fall of temperature, and the body is said to become colder. Cold is, therefore, not a definite entity like heat; it is merely the absence of motion. A body without any heat motion would be at a truly absolute zero of temperature, and, therefore, absolutely cold; it could in that state suffer no further lowering in temperature. Molecular heat motion may be regarded, though not with absolute certainty, as some form of vibrating motion such as a backward and forward linear motion, combined with rotation of the particles. Such individual motions tend to keep the particles apart from each other, and, if intensified, it would appear natural that each particle would demand more space for its movements, and the whole mass of the warm body occupy a greater space than before. Such is found to be actually the case; most bodies expand on heating and conversely contract when cooled. [EXPANSION.] Certain properties of substances, such as resistance to the passage of an electric current, are found to suffer change when the body changes in

temperature; regarding the transit of electricity as being effected by the material particles themselves, and not by the spaces between them, such changes are not surprising, when we regard these spaces as diminishing with a lowering of temperature. Taking the extreme case of a body at absolute zero of temperature, molecular motion no longer exists, and that hindrance to close contact of the separate particles is removed. The electrical resistance under such circumstances is likely to be entirely removed—at any rate for particles that are identical in character with each other, such as those of a pure metal. The particles of a body are not all possessed of exactly the same intensity of motion, though their frequent impacts with each other are likely to assist in distributing such motion uniformly throughout the mass. The degree of their intimacy is an important consideration in determining their readiness to transmit heat motion from one portion of the mass to another. This power of transmitting heat is called *conduction* (q.v.), and from the above considerations it will be seen that, as a rule, good conductors of electricity should also be good conductors of heat. This is found by experiment to be the case, and the converse also generally holds that bad conductors of heat are bad conductors of electricity. The few experiments that have been made on the change of conductivity of heat on a metal for different temperatures, demonstrate the significant fact that the resistance to flow of heat, like that of electricity, diminishes as the temperature is lowered. One of the most powerful reasons for believing that heat is a vibratory motion is that it can be transmitted through free space by radiation (q.v.), that is, by oscillatory motion transmitted through the ether (q.v.), without the assistance of material particles. Radiation is not heat, but it is a transfer of vibratory motion. A hot body can supply heat to produce radiation, and will, therefore, become colder. Any body containing heat surrounded by a medium capable of radiation will continually give out heat, even if it be the coldest body in any system, since it cannot help giving motion to the medium surrounding it. In fact, all bodies continually give out heat, and all continually receive heat; those that are hottest will give out more than they receive; those that are coldest receive more than they emit. This is known as the theory of exchanges (q.v.), due originally to Prévost and expanded by Stewart. The tendency is always to cause an equal distribution of intensity of heat. It depends upon the nature of the substance whether it readily accepts radiation that passes into it. Just as certain substances are transparent to light and allow it to pass through readily without being affected thereby, so there are substances transparent to heat. These are called *diathermanous*, and are exemplified in rock-salt, and in liquid oxygen. Such substances might remain at very low temperatures, in a much warmer enclosure, if well surrounded by a very good vacuum.

It has been stated that heat, being a form of energy, may be measured in energy units. A quantity of heat may, for example, be expressed in foot-pounds (q.v.) or ergs (q.v.). Nevertheless, the

existence of units of temperature-increase [CENTIGRADE, FAHRENHEIT], long before the dynamical theory of heat was propounded, involved the adoption of other units. The *caloric* for instance is the amount of heat necessary to raise the temperature of one gramme of water one degree centigrade. This has its equivalent in foot-pounds or ergs, and it is to Dr. Joule that we owe a variety of exact experiments to determine their relation. His investigations show that the *mechanical equivalent* of the calorie is approximately 42×10^6 ergs.

The statement of this relation is known as the First Law of Thermodynamics. If we now suppose a calorie of heat to be given to one gramme of iron, theory helps us to see that its temperature will not suffer just an increase of one degree; and if the calorie be given to copper, the temperature increase will be different to that of iron. For an atom of copper is heavier than an atom of iron, their masses being in the ratio of 56 to 63. Thus one gramme of copper will contain fewer atoms than one gramme of iron, their number being in the ratio of 56 to 63. So equal quantities of heat applied to equal masses of each metal will raise the temperature of the copper more than that of the iron. The number of calories required to raise one gramme of any substance through one degree is called its *specific heat* (q.v.), and the above considerations lead to the conclusion that for simple substances and for compounds of similar composition to each other the specific heats are inversely proportional to the atomic weights. This is known as Dulong and Petit's law. The specific heat of water is unity, by definition of the calorie. All other substances have specific heats less than unity, excepting hydrogen gas, whose specific heat is 3.4. Concerning gases it may be stated that the specific heats are the same for equal volumes of all simple gases that are not near to their vaporous condition, which is really only another way of stating Dulong's law.

The most marked effect of heat on a substance is that of changing its state from solid to liquid, or from liquid to the gaseous. While the change is going on, there is no temperature increase; all the heat absorbed goes to change the state, without, as a rule, changing the temperature. Such heat is transformed into molecular motion other than heat motion, and shows itself in the greater freedom possessed by the particles of the substances, after the change has been effected. Thus the particles of liquid water are capable of much greater freedom than those of ice; and particles of steam are still more richly endowed with energy of motion whereby they may travel through space freely. A definite amount of energy is required to change the state of every substance in the same way, 80 calories for the conversion of ice at 0° C. to water at the same temperature, and 537 calories for water to steam at 100° C. Certain substances, in changing from solid to liquid, require a small range of temperature for the process. Wrought-iron, for example, passes through a plastic state in its change from solid to liquid—a fact of much practical importance in the arts. [WELDING.] The same occurs with ice, but the plastic state

lasts for a much smaller range of temperature. [REGELATION.]

The practical application of heat-energy for the performance of work depends on the conversion of the invisible molecular heat-motion into visible motion of aggregations of molecules. The process is therefore only directive, and if we were able to control individual molecules better there is no reason why we should not be able to get energy out of any warm body. But all heat-engines depend upon the use of two temperatures; heat-energy will not flow freely from a body, leaving less therein, unless its temperature be higher than that of its surroundings. This is known as the Second Law of Thermodynamics. The greater the difference of temperatures employed in the engine, and the lower the highest temperature employed, the more efficient will it be. The maximum efficiency possible is, in fact, calculated to be $t_2 - t_1 \div 273 + t_2$, t_2 being the highest temperature employed in the substance (steam, gas, or hot-air) whose heat-energy is being converted, and t_1 its lowest temperature, both being expressed in centigrade degrees. [GAS-ENGINE, STEAM-ENGINE.]

Heath, the common name of the species of the genera *Calluna* and *Erica*, which belong to the gamopetalous family Ericaceæ. They are evergreen under-shrubs with wiry stems, small narrow evergreen leaves generally in whorls, four sepals, a bell-shaped or tubular corolla of four petals, eight stamens, and a four-chambered capsule. The best known is the heather or ling, *Calluna vulgaris*, which has a pink calyx. It grows socially on the poorest soil and at considerable elevations, covering the moors of Scotland and the north of England, and affording shelter and, in its shoots, food to the grouse, black game, and mountain hare. It is made into brooms, brushes, baskets, or thatch, and is used as fuel, whilst formerly it was used in brewing, tanning, and dyeing. It is the bed of the mountaineer, and one not to be despised. It forms the badge of the clan M'Donell.

The crimson or fine-leaved heath, *Erica cinerea*, with leaves in whorls of three, and deep-red flowers also in whorls, occurs on lower moors often as abundantly as ling. It is the badge of the M'Alisters.

E. Tetralix, the cross-leaved heath, with four leaves in a whorl and an umbel of pale pink flowers is common, but seldom so abundant as the two before-mentioned. It is the badge of the M'Donalds.

There are several other species (*E. vagans*, *E. citiaris*), in Cornwall and Ireland, the headquarters of the group being South Africa. All heaths are rich in honey.

Heather. [HEATH.]

Heathfield, LORD (1717–90), an English general, is better known as General Elliot. He was born at Stobs, Roxburghshire, the seat of his father, Sir Gilbert. Educated at Leyden, Woolwich, and La Fère (a French military college), he entered upon a long military career, during which he saw service in three great wars. He was wounded at Dettingen, in the Austrian Succession War, and

from 1759 to 1761 was with Frederick in the last period of his seven years' struggle. The culmination of his career was reached when in the next war he successfully defended Gibraltar from June, 1779, to the beginning of 1783, destroying the Spanish ships with "Elliot's red-hot balls." He was created a peer in 1787.

Heating. The attainment of a suitable temperature for any definite purpose may be brought about in various ways. The high temperatures necessary for steam boilers, for example, are produced by complete combustion of coal, gaseous or liquid fuel, in a confined space in close proximity to the boiler. A conservatory is generally of glass, through which the bright radiant heat from the sun may pass, without being able to return, and so the internal temperature is gradually rendered greater than the external. Ordinary English rooms are warmed by open grates containing burning coal or wood, a certain low percentage of the total heat emitted passing into the room as radiation. A gas-burner or oil lamp in a room radiates heat in all directions, and also allows the hot gaseous products of combustion to assist in warming; it is thus a fairly efficient heater, but a disagreeable one on account of the deleterious effects of the gases that pass into the air. Close stoves prevent these combustion-products from passing into the air, but they may be efficient heaters if their flues have a considerable surface-area within the room before leading to the chimney. These flues rapidly get heated, and so radiate heat into the room, the actual products of combustion being comparatively cool by the time they reach the chimney.

Heating by means of gas is discussed under the article. GAS HEATING. It is here desirable to mention the chief modes of heating by hot water and hot air.

Hot-water heating is now effected by one of two systems, high-pressure and low-pressure. In the high-pressure system small wrought-iron pipes of great strength pass from a *boiler-coil* in the furnace upwards through the set of rooms, etc., in the building to be warmed. The boiler-coil is simply that part of the arrangement which acts as a boiler and which is composed of lengths of pipes in series instead of a single boiler-shell, for the sake of extra strength and greater heating surface. The pipes rise to the highest part of the building, and then return by vertical stretches to the boiler-coil again. The system forms a complete circuit, through which water flows to the exclusion of all air except such as is dissolved in the water. But to allow for expansion of the water on heating a special cylindrical expansion-pipe is attached to the topmost portion of the circuit. It contains air, and is so placed that expansion of the water is permitted therein by compression of the air. When the furnace is fired the water in the coil becomes hot, and rises by reason of its lightness as compared with that of the colder column of water in the return pipe. The speed of flow is kept up continually by this difference of temperature between the supply and the return, the latter always

being at the lower temperature on account of the heat losses during the flow through the building. The whole circuit being of great strength, it is possible to raise the temperature safely up to 200° C. The water being completely enclosed, it does not boil, but its pressure rises to perhaps ten atmospheres. The speed of flow is very great, but the working seems safe.

In the low-pressure system the same theoretical conditions hold for the flow of water, but the pipes are larger, the boiler is of the more usual form, and the speed of flow is much lower. It has the advantage over the other systems of supplying a more uniform temperature; the pipes are not so inconvenient to touch, and do less harm by contact with woodwork, etc. But the high-pressure system employs smaller pipes, more convenient to fix, and proportionately stronger. There is less liability of clogging in the tubes, and the boiler efficiency is greater.

Hot-air systems supply a current of air from heating-tubes in a furnace, in much the same way as the hot water is supplied in the above systems. The air is set free into the room to be warmed, and if not too warm the effect may be agreeable. But the most pleasant warmth is experienced by radiation, and not by actual contact with a warm atmosphere. Also air currents behave in a way that has not yet been fully explained, frequently confining themselves to a small portion of a room without spreading out so as to affect the whole. In fact, the practical difficulties attached to hot-air systems of heating have not yet been overcome.

Heaton Process. A process, also known as the *nitrate* process, for the production of steel from "pig-iron." This is effected by the oxidation of the carbon, sulphur, and phosphorus and of the iron by means of sodium nitrate, and is carried out as follows: The iron is melted in a cupola, and the molten metal is poured into a cylindrical wrought-iron vessel, lined with fireclay—the *converter*. The bottom of the converter contains a charge of nitrate of soda, iron ore, sand, and oxides of manganese, and is covered by an iron grating to prevent the mass from rising to the surface of the melted iron. A vigorous action takes place, and large quantities of fumes escape from the top of the converter, the action being completed in about ten minutes. The bottom of the converter is movable, so that the mass of "crude steel" can be removed, and afterwards reheated, hammered, and rolled into bars.

Heaven. The Hebrew word (*Shamiam*) translated in the Bible "heaven" or "heavens," had in the first instance a physical meaning, but it was also used to denote the abode of God, the region of ineffable light and glory, from which He views and controls the universe. The Christian revelation imparted a fuller conception of the nature of Heaven. In the New Testament it is used in a twofold sense: it is (1) the *place* whither Christ has ascended, and where He makes intercession for mankind, where saints and angels adore the Almighty, and where the redeemed will at last enter into the joy of the Divine Presence; (2) the *condition* of those who have been justified and

raised to a state of grace by the blood of Christ, and who even in this life are made partakers of the joys of Heaven, through their consciousness of union with Him. The belief in a region where the gods dwell, apart from human care and pain, forms an essential part of most Pagan religions.

Heavystone, a mineral known also as *tungsten* or scheelite, and consisting of the tungstate of calcium, CaWO_4 . It varies in colour from white to orange yellow, has a hardness of 5, the high specific gravity of 6. It occurs in a number of localities, but only in small quantities, and is frequently found associated with tin ores, amongst which it was formerly classified.

Hebe, the goddess of youth, or in Latin mythology, Juventas, was the daughter of Zeûs and Hêra. In Homer and Hesiod she is a virgin, until the deification of Hêracles (Hercules), but in later writers, such as Apollodôrus, she is the mother of his two sons, Alexiarus and Anticetus. In the *Iliad* she is represented as cupbearer to the gods, and she was worshipped as such at Sicyon and Phlius. At Athens she had an altar near that of Hêracles; while at Rome there were two temples to Juventas. She was supposed to have the power of restoring youth.

Heber, REGINALD (1783–1826), an English divine and poet, was born at Malpas, Cheshire, and educated at Brasenose College, Oxford, where he gained the Newdigate prize with his *Palestine* in 1803. He became fellow of All Souls' next year, and was Bampton Lecturer in 1817. After holding the benefice of Hodnet in Shropshire for several years, he was appointed Bishop of Calcutta in 1823, but died of apoplexy after three years. Besides contributing to the *Quarterly Review*, he edited the works of Jeremy Taylor, and wrote some of the best hymns in the *Ancient and Modern* collection. One of the finest of them is "Holy, Holy, Holy," and the most popular, "From Greenland's icy mountains." Heber's half-brother RICHARD (1773–1833) was a great book-collector.

Hébert, JACQUES RENÉ (1757–94), one of the most influential of the extreme revolutionists, was born at Alençon, where his father was a goldsmith. Before the Revolution he was employed at the box-office of the Variétés théâtre, but in 1790 he established his infamous journal *Le Père Duchesne*. It has not been proved that Hébert took part in the September massacres, but his journal always strongly advocated proscription. On September 22nd, 1792, he became the deputy of Chaumette, procureur of the Commune (q.v.). With the help of the Cordeliers Club and the Sections, the Hébertists were able to overthrow the Girondins (q.v.), by whose committee of twelve Hébert had been for a short time put under arrest; but they incurred the dislike of Robespierre by their atheistic principles and their influence with the sansculottes, and, having indiscreetly talked of insurrection, they were speedily tried, condemned, and guillotined in the spring of 1794.

Hebrew Language. [SEMITIC LANGUAGES.]

Hebrews, EPISTLE TO THE. The canonical authority of the Epistle, implicitly acknowledged in the references of Clemens Romanus (A.D. 70 or 95), does not seem to have been called in question till the middle of the 2nd century. From that time to the end of the 4th century it was rejected by the Roman and North African churches, which regarded it as the work of Barnabas. It was always accepted by the Greek and Eastern Churches, and, owing to the arguments of Jerome and Augustine, it was restored to the canon in the west by the 3rd Council of Carthage (397) and a decretal of Pope Innocent (416). The question of its authorship has furnished a more enduring ground for controversy. The early churches, excepting the North African, regarded it as the work of St. Paul. The Alexandrian fathers introduced the view that it was originally written or at least inspired by St. Paul, and afterwards transcribed from his dictation, or translated from Hebrew into Greek by St. Luke, and this became the general opinion of the Church. Luther, however, maintained that it was written by Apollos, and, among more recent authorities, Neander ascribes it to some unknown member of the Pauline school, and Ewald to a Jewish teacher, resident at Jerusalem. It is doubtful whether it was addressed to the native Jews of Jerusalem or Palestine alone, or to Jewish believers throughout the world; internal evidence rather favours the former view. The allusions to the Temple services show that it was written before the destruction of Jerusalem (70), and the best biblical scholars assign it to the year 63. Against the view that the Greek version is a translation from the Hebrew, Bleek maintains that the purity of the language, the character of the idioms, and the quotations from the Septuagint, show it to be an original composition.

Hebrides, THE, a name given to all the islands on the west coast of Scotland. In the group was anciently included the Isle of Man; and the title "Sodor and Man" perpetuates the memory of the connection, "Sodorenses" (insulæ) being a Latinised form of the Scandinavian name of the Hebrides, "Sudreyjar." The Hebrides are divided into two groups, the Outer Hebrides, the chief islands of which are Lewis, North and South Uist, Barra, and Benbecula; and the Inner Hebrides, composed of Skye, Mull, Jura, Islay, Rum, Coll, Tiree, Eigg, Iona, Ulva, Colonsay, and other smaller islands—in all making some five hundred. Bute and Arran are also generally reckoned among them. There is some land under cultivation, but a large part of the soil consists of poor pasture, morass, and peat-moss. Gaelic is spoken by the common people, who are usually very small farmers ("Crofters"). The climate is mild but damp. For political purposes the Hebrides are merged in the counties of Ross, Inverness, Argyll, and Bute. Among the descriptions of the islands is Dr. Johnson's *Journey to the Hebrides*.

Hebron, of which the modern name is EL KHALIL, is 21 miles S.S.W. of Jerusalem, in the valley of Eskcol. It was at first known as Kirjath-arba. Here David reigned for seven years as King of Judah. The mosque "El Haram" is built

on the supposed site of the cave where Abraham and his descendants were buried, and replaces the church built by the Empress Helena.

Hecataeus (HEKATAIOS) of Miletus, "the logographer," an early Greek writer, died probably about 476 B.C. Some time before the Ionian revolt, against which he in vain remonstrated, he travelled in Egypt, and throughout the Persian Empire. He embodied the results in two works, the *Periēgēsis* and the *Historiæ*. The former was a description of Europe, Asia Minor, Egypt, and Libya; the latter, an account in the form of genealogies (hence its alternative title *Genealogiæ*), of Greek fables and traditions. Herodotus made much use of these works, but controverted some of their statements. The fragments, which remain, have been collected and edited by Creuzer, Klansen, and C. and T. Müller.

Hecate, a goddess about whom there are many varying traditions. By some writers she is called a daughter of Persæus, by others of Zeus, by others again of Leto. She is not mentioned in Homer. According to Hesiod and Apollodorus she was a Thracian divinity who assisted the gods in their war with the giants and had power over all departments of life and things. She was confounded with Demeter, Artemis, Persephone, and other deities, and was worshipped especially in Ægina, Samothrace, and Argos. Small statues of her (*Hecataea*) were numerous also in Athens, and stood before houses or at cross roads, and were consulted as oracles. In later times, from her confusion with Persephone, Hecate came to be regarded almost exclusively as a goddess of the nether world.

Hecatomb (Greek *hekatombē*, from *hekatōn*, a hundred, and *bous*, an ox), literally an "offering of a hundred bulls," but used generally of any sacrifice to the gods in which a large number of animals was slain. Hecatombs are frequently mentioned by Homer, and at Athens they gave its name to the month in which they were offered.

Hecker, FRIEDERICH KARL FRANZ (1811-81), a German revolutionary leader, was born in Baden, and for several years practised as an advocate at Mannheim. Some years previously to the revolution of 1848 he plunged into politics and became a Socialist chief. Having failed to attain his ends by constitutional measures, he headed a body of men who invaded Baden, and were defeated at Kandern. He now fled from the Fatherland, and passed the rest of his life in the United States. Here he took part in the Civil War, and died at St. Louis.

Hecla, a volcano in Iceland, 68 miles E. of Reykjavik. It is 5,102 feet above the level of the sea, and has five craters. Of the eighteen eruptions which have taken place during the last ten centuries most have been very violent, and that which began in September, 1845, continued for more than a year. On this and other occasions fine dust in large quantities has been scattered to a very great distance.

Hecla Powder, an American explosive, the basis of which is nitroglycerine, its composition being very similar to that of Hercules powder (q.v.).

Hectare is a French unit of measurement of area. It is equivalent to 100 ares, or about 2.47 English imperial acres. It is usual to express quantities of land in hectares, the are being rather too small for the purpose.

Hector, the Trojan leader, was the eldest son of Priam and Hecuba. According to Lucian, he slew Protesilaus, the first Greek who landed on Trojan territory. In the *Iliad* he challenges Menelaus; reproaches Paris with cowardice; takes leave of his wife Andromache and her child at the Sæan gate; is wounded in a fight with Ajax Telamonios, with whom he exchanges presents; afterwards repels an attack by him, and is cured of a wound by Apollo; slays Patroclus and takes his armour; is forbidden to fight with Achilles, by Apollo, and protected by him in the first combat; and on another occasion is chased three times round the city by him. Finally, aided by Athena, Achilles revenges the death of Patroclus on his slayer, and, tying Hector's body to his chariot wheels, drags it into the Greek camp, but it is given up to Priam at the command of Zeus.

Hecuba (HEKĀBE), daughter of Dymas, and second wife of Priam, King of Troy. In the tragedy of Euripides which bears her name, Hecuba was carried away as a slave by the Greeks to Chersonesus, where her daughter Polyxena was sacrificed before her eyes, and she tore out the eyes of Polymestor, who had murdered her son Polydorus. Another account makes her leap in despair into the Hellespont. Ovid describes her as being metamorphosed into a dog, which went about Thrace howling.

Hedge, a fence formed of living bushes or small trees planted close together and used in agriculture and gardening, both as a means of protection and as a method of decoration. In some countries hedges are in general use; in others—e.g. France, Germany, and America—they are almost unknown. They are probably commoner in Great Britain, especially England, than in any other part of the world. Before the 17th century, however, they were not much used in agriculture, for under the old system of tillage, called the "three-field system," a "township" was divided into three strips, one of which lay fallow, while in each of the others a different crop was grown, and the land assigned to each individual consisted of plots distributed indiscriminately among the three strips; these small plots were separated only by balks, and it was not till the common-fields gave way to the practice of enclosing land that hedges became common. A very interesting summary of the advantages of "quicksettynge, dychyng, and hedgyng," is given in Fitzherbert's *Book of Surveying* (1539). In England hedges are usually made of hawthorn, excepting in lofty and exposed situations, where the elder and mountain ash thrive better. These afford the required shelter, but are less serviceable as a means of repelling intruders.

The other plants used include the beech, crab-apple, and blackthorn; while ornamental hedges are made of holly, yew, privet, arbor vitæ, barberry, etc.

Hedgehog, any species of the genus *Erinaceus*, the type of the Old World Insectivorous family *Erinaceidae*. In this family the zygomatic arch is complete, the small bones (the tibia and fibula) of the hind limbs are united, and the back is clothed with hairs more or less mixed with spines. The common hedgehog (*E. erinaceus*), about 10 inches long, is British, and, like the other thirteen species, has the power of rolling itself up in a ball, so as to present only the spiny armour of the back to a foe. The legs are so short that the belly nearly touches the ground as the animal moves; the spines are dirty-white, ringed with black, the coarse hair yellowish-white, and the sharply-pointed nose black. The species are nocturnal, and feed on insects, molluscs, frogs, toads, snakes, and vipers. The common hedgehog is sometimes kept to clear houses of cockroaches. The only other genus, *Gymnura*, has a single species (*G. rafflesii*), a shrew-like animal, some 26 inches long, 12 of which comprise the tail. It is a native of the Eastern Archipelago, and has a few bristles mixed with the softer hairs, but it cannot roll itself up into a ball.

Hedgehog Transformer, in electrical engineering, a special kind of transformer for the conversion of an alternating current of low potential and high current strength into one of high potential and low current strength, or *vice versa*. [TRANSFORMER.] The important characteristic of this transformer is that its soft iron core does not form a closed circuit; its ends are free, and the magnetic circuit is continued through air from the one pole to the other. It seems to be shown practically that such open circuit transformers are not so efficient in their conversion of electrical energy from one potential to another, as closed circuit instruments; the reason is as yet unknown.

Hedge Sparrow (*Accentor modularis*), a common British bird. The adult male is about 6 inches long, and the female somewhat smaller; the general plumage is a dusky reddish-brown. They feed on insects, larvæ, and seeds. [ACCENTOR.]

Heem, JAN DAVIDSZ VAN, a great Dutch painter, son of David van Heem, a flower-painter, was born at Utrecht at the beginning of the 17th century, and died at Antwerp between 1675 and 1685. Examples of his work are to be found in many Continental galleries.

Heeren, ARNOLD HERMANN LUDWIG (1760–1842), an able German historian, was born near Bremen, and educated at Göttingen, where he subsequently became professor of philosophy and of history (1801). His chief works were *Historical Researches into the Politics, Intercourse (Verkehr) and Trade of the Chief Nations of Antiquity*, published in 1793–96, and translated into English in 1833, and *History of the Political System of Europe*, published in 1800, and translated in 1833.

Hefe, KARL JOSEPH VON, a Catholic theologian, was born in 1809; his chief works are *Patrum Apostolicorum Opera* and *Konziliengeschichte*.

Hegel, GEORG WILHELM FRIEDRICH (1770–1831), a German idealist philosopher, was born at Stuttgart. While studying at Tübingen he saw much of Schelling, by whom he was greatly influenced. After having been some years tutor in a family, he, in 1801, came to Jena, where he was *privat-docent* and professor-extraordinary. During these years he conducted with Schelling a philosophical journal, but his *Phänomenologie des Geistes*, published in 1807, showed a divergence from the views of that thinker, as well as from those of Kant and Fichte. When the university was broken up in consequence of the French invasion, Hegel was for a short time a newspaper editor at Bamberg, and then passed nine years as director of the Nuremberg Gymnasium. In 1816, after the publication of his *Logik*, he was made professor at Heidelberg, which he left two years later for Berlin, where for the rest of his life he held the chair of philosophy. He was married in 1811, and died of cholera twenty years later. As an example of his power of concentration, the story may be mentioned that he was in Jena on the night of the great battle completing one of his works, and knew nothing of what had occurred till the next morning. His chief works were his *Wissenschaft der Logik* (1812–16), his *Encyclopädie der Philosophischen Wissenschaften* (1817–27), and the *Philosophie des Rechts* (1821). Besides these, in the collected edition, published by his pupils after his death, were contained his lectures on the *Philosophy of Religion, Art, and History*. Hegel's philosophy may roughly be described as a very elaborate form of Pantheism or Monism. Its leading characteristic is perhaps its insistence on the idea of continuous progressive development in thought and things (a progress which perpetually involves the passage of a thing into its opposite and the subsumption of the two under a higher unity, including both), on the essential oneness of thought and things, and on the doctrine that the progress of each individual repeats that of the race and the world. All these notions have been independently developed by evolutionist thinkers, especially in biological science. "The real is rational and the rational is real," was his main doctrine. Hegel's lectures exercised an enormous influence upon the German thought of his day, and an order of the Prussian Government gave his doctrines official recognition as the authorised philosophy of the universities. But after his death his disciples began to be divided in their interpretation of his system.

Hegesippus, an early Christian writer, who lived probably in the 2nd century. Very little is known of his life, but he is said to have been a Jewish convert; and he says of himself that he made a journey to Rome, and compiled a list of the Bishops of Rome from 156 to 167. His *Five Memorials of Ecclesiastical Affairs* is quoted by Eusebius, and exists only in fragments.

Hegira, or HEJRA (Arabic). the "emigration" of Mohammed (q.v.) from Mecca to Medina in 622 A.D., which, 17 years later, was made by the Kalif Omar the starting-point of the Mohammedan calendar. The new era began with the first new moon in the month Moharrem, which is generally supposed to have fallen on July 16th, but, according to Caussin de Perceval, the true date is April 19th. The Mohammedan era is reckoned by lunar years of 354 and 355 days.

Heidelberg, a town in Baden, near the left bank of the Neckar, 54 miles S. of Frankfort-on-the-Main, is situated in beautiful country at the foot of the hill called the Königsstuhl ("King's-seat"). Above the town, at the height of 300 feet, are the ruins of a castle whose foundations were laid in the 13th century. Here the Electors-Palatine resided from the 12th century till 1802; in its cellars is the Heidelberg Tun, which once held 50,000 gallons of wine. Among the buildings of Heidelberg the most notable are the church of the Holy Ghost (late Gothic) and the church of St. Peter, to which Jerome of Prague nailed his theses. The university, founded by the Elector Rupert I., in 1386, is one of the most famous of German seats of learning. There are upwards of 100 professors and lecturers, and nearly 1,000 students. It has a fine collection of MSS. and 500,000 books. Among those who have held chairs at this university are Reuchlin, Puffendorf, Gervinus, Kuno Fischer, Helmholtz, and Bunsen. Heidelberg, as a centre of Calvinism, suffered much in the Thirty Years' War; and its castle was almost destroyed by the French forty years later. Books and wine are the chief objects of trade.

Heights, DETERMINATION OF. This may be effected by calculation from data supplied by ordinary surveying instruments, the necessary formulæ being supplied by trigonometry. Also it may be obtained by careful measurement of the barometric pressure at the unknown height, if at the same time the pressure at another known level in the vicinity be observed. This barometric pressure is usually in accurate work taken with a mercurial barometer. Such as are employed for the determination of the heights of mountains are specially constructed to admit of transport without danger of fracture. Aneroid barometers (q.v.) may also be used; they are far more portable and less liable to damage, but they are less accurate, and to get satisfactory readings it is necessary to have closely studied the behaviour of the special instrument employed under various conditions of pressure and temperature. Scales of height are often attached, but theory requires that a separate scale should be used for every value of barometric pressure at sea-level. Hence the results of using such a scale are only approximately correct, perhaps strictly so in the one case where zero-level pressure is 31 inches of mercury. A third way of determining the pressure, and of therefore estimating the height, is by observation of the boiling-point of water. The temperature at which this takes place is 212° F. at a pressure of 30 inches of mercury; but as this temperature becomes

lower when the pressure is lowered, and as the relation between the pressure and the boiling-point is accurately known the above object may be readily obtained. A portable piece of apparatus for supporting a sensitive thermometer in the vapour proceeding from boiling water is constructed for height-measurements and is known as the *hypsometer*.

Heilbronn, a town in Würtemberg, 28 miles N. of Stuttgart, stands on the right bank of the Neckar. It is a very old place, and the streets have still a mediæval air about them. In 1360 it became an Imperial town, and after much suffering in war, fell to Würtemberg in 1802. The chief objects of interest in it are the church of St. Kilian, the town-hall, and the "Thief's Tower" (Diebsthurm), in which Götz von Berlichingen was imprisoned; what is now a barrack was formerly the hall of the Teutonic Knights. Silver-plate, chemicals, and paper are made here; and a large grocery trade is carried on. There are also fairs in which cattle, fruit, wool, and leather are sold.

Heine, JOHANN HEINRICH (1799-1856), the greatest of German writers after Goethe, was born at Düsseldorf, of Jewish parents. Here he went to school and struggled with Greek and Latin grammar, and gazed with admiration upon the soldiers of his hero Napoleon. After making trial, in deference to the wishes of his relatives, of his fitness for a commercial career at Frankfort and in Hamburg, and falling in love with his cousin at the latter place, he was sent by his rich uncle Solomon to the university of Bonn, on condition of his adopting the legal profession. He studied law, indeed, and actually took a degree at Göttingen in 1825, but he gave more attention to the lectures of Schlegel. From 1821 to 1825 he was at Berlin, where he heard Hegel lecture, and made the acquaintance of Rahel, wife of Varnhagen von Ense. Here also he published his first poems and two tragedies. Before taking his degree he had to qualify for the legal profession by being baptised, although he had no more belief in Christianity than he had in Judaism. The next few years saw his best work done, as the first half of the *Reisebilder*, his prose masterpiece, appeared in 1826-27, and the *Buch der Lieder* in the latter year. The next few years of Heine's life were passed chiefly in Munich in journalistic work, some of which, as the *Französische Zustände*, has been republished. The expression of his revolutionary sympathies brought on him the displeasure of the Prussian Government, and in 1831 he took up his abode in Paris. Here he lived for the rest of his life, but paid short visits to Germany, notably that of 1844, of which *Deutschland* was the outcome. In 1836 he republished a criticism upon the subjects of his early admiration, *Die Romantische Schule*, and though still full of revolutionary ardour, was impelled by an intense hatred of its German advocates to write a fierce attack on Ludwig Börne in 1840. This brought upon him a duel with Börne's widow's husband. He had already been engaged in a hostile encounter on account of Mathilde Mirat, a Paris *grisette*, whom he had

married after living with her for four years. Enjoying the best literary society of Paris in spite of his Bohemian proclivities, his days were happy until his health, which had never been robust, finally broke down in 1848, when a spinal disease confined him to his bed for the rest of life. Meanwhile, he had published between 1835 and 1840 the miscellaneous writings contained in *Der Salon*, and *Atta Troll*, a poem (1846). During his years of suffering his intellect remained unimpaired, and the *Neueste Gedichte* and *Romanzero* showed something like a return to his earliest and best work. He was buried at Montmartre in the land of his adoption. Heine has been called the Voltaire of Germany; but while he had to the full the French feeling for style, he had depths of sensibility to which no Frenchman, except perhaps Hugo, ever penetrated. His poems have been translated by Bowring, Lord Lytton, Sir Theodore Martin, J. Geikie, and many others; his entire works by C. G. Leland. There are English lives by W. Sharp and Stigand; and the essays on Heine by Matthew Arnold and George Eliot (the latter little known) are both appreciative and suggestive.

Heineccius, JOHANN GOTTLIEB (1681–1741), a learned German jurist, was professor of philosophy at Halle from 1713 to 1720, and twice held the united chairs of law and philosophy at that university (1720–23 and 1733–41), besides occupying similar posts at other universities. He wrote upon philosophical principles the following, amongst other works: *Historia Juris Civilis Romani* (1733), *Elementa Juris Germanici* (1735), and *Elementa Juris Naturæ et Gentium* (1723), the last of which was translated into English. His brother, JOHANN MICHAELIS (1674–1722), was author of a work on ancient German seals.

Heir, Heiress, the person to whom the inheritance of lands descends according to a certain prescribed order of descent, and he is either "heir-apparent" or "heir-presumptive." An heir-apparent is one who will be heir to his ancestor if he survive him. He is not heir in the proper sense of the word until after the death of his ancestor, for "*nemo est hæres viventis*." Formerly the term "heir-apparent" was applied to the nearest living heir, for he would be heir if the ancestor died immediately, while no distinction was made between an "heir-apparent," who must be heir in any event, and an heir-apparent whose claim is liable to be defeated wholly or partially by the birth of a nearer heir or coheir. At the present day, however, "heir-apparent" means one who, if he survive the ancestor, must certainly be his heir—*e.g.* an eldest son in ordinary cases; while any other heir is called an heir-presumptive, because his claim to inherit is liable to be defeated by the birth of a nearer heir. An heir ("apparent" or "presumptive") according to the above distinction, then, is the nearest blood relation capable of inheriting to his ancestor. The term "heir" is also used as a word of limitation to denote the quality of an estate of inheritance on its creation. This was formerly imperative, but by the "Conveyancing Act, 1881," the word "heirs" or "heirs of my body" are no longer necessary to create

an estate in fee-simple or fee-tail, and by the "Wills Act" it is enacted that where any real estate shall, after the passing of that Act, be devised without words of limitation, it shall be construed to pass the whole interest which the testator had power to dispose of, unless a contrary intention should appear by the will. A bill introduced by the Lord Chancellor for making the devolution of land the same as personal estate (in default of a will) has recently been thrown out by only a very small majority in the House of Lords. [DESCENT, WILL.]

Heirlooms are such goods and personal chattels as, contrary to the nature of chattels in general, go by special custom to the heir or devisee of the owner along with the inheritance, and not to his executor. The owner of an heirloom cannot dispose of it by will, so as to sever it from the inheritance, though he may dispose of it during his lifetime.

Hel, the Scandinavian goddess of the lower regions, was the daughter of Loki and Angurboda. The darkness of her aspect betokened the fierceness of her character. All who died of old age or sickness were the victims of her cruelty and her greed.

Helder, THE, a port of Holland, 51 miles N.W. of Amsterdam. Situated at the northern end of the North Holland Canal, it has a good harbour, and is a strong fortress as well as a port. There is an arsenal and a naval training-college, and also a meteorological institute.

Helen, the beautiful woman whose abduction by Paris was the cause of the fall of Troy. Her father was said to be Zeus, who visited her mother Leda in the form of a swan. Her great beauty caused her to be carried off in her youth to Attica by Theseus and Peirithöus; but she was rescued by her half-brothers Castor and Polydeuces, or Pollux, and afterwards given in marriage to Menelaus. From him Paris, with the help of Aphrodite, carried her off to Troy. Then Menelaus got together a mighty host of Achæans, some of whose leaders had been Helen's suitors, and after a ten years' siege Troy was taken. There are various accounts of what happened to her later. One makes her marry Deïphöbus, the brother of Paris, and betray him to Menelaus, with whom she returns to Sparta. In another she marries Achilles. In a third she is driven from Greece and flies to Rhodes, where she is strangled by Polyxo. In two plays of Euripides she is an important character. In the *Troades* she uses all the arts of apology to win back Menelaus. Another myth, alluded to by Stesichorus and Herodotus, related that only a phantom Helen went to Troy, the real Helen being safe in Egypt all the time. The last Greek poet who dealt with the subject was Quintus Smyrnæus. Virgil, in the *Æneid*, makes her salvation from the wrath of Æneas in the temple of Vesta come from Venus.

Helena, the largest town in Montana, is in the Prickly Pear Valley between the Rocky Mountains and the Missouri river. Until lately it was only a collection of gold-diggers' log-cabins, and was called Last Chance Gulch. The seat of the State

government, it has Government offices and several other buildings, and is an important railway centre.

Helena, the EMPRESS, mother of Constantine, became a Christian after the defeat of Maxentius. Iraclibim says she visited Jerusalem in 326 and discovered the Holy Sepulchre and the three crosses. She was canonised after death, her festival being August 8th. There is a saint in the Greek Church of the same name, who lived in the 10th century, and was of noble birth.

Helianthaster, an extinct genus of starfish, occurring in the Devonian rocks, and especially in some slates that are in Germany.

Helicon, a range of mountains in Bœotia, ancient Greece, were the fabled abode of the Muses. From them sprung the founts of Aganippe and Hippocrene, draughts from which gave inspiration. The village of Ascrea at the foot of the mountains was the home of Hesiod.

Heligoland, a small island in the North Sea some 35 miles from the mouth of the river Elbe. It is about a mile long and a third of a mile broad. The greater part of the houses are on a rock 200 feet high. In the bathing-season it is visited by large numbers of tourists. Bathing takes place from Sandy Island or Düne, a sandbank about a mile distant. A great deal of fishing is carried on. Heligoland was taken from the Danes in 1807, and ceded to England by the treaty of 1814. By an agreement with Germany in 1890 it was given up to the Empire in exchange for certain concessions in East Africa. The language spoken by the inhabitants is German. The fishermen are Frisians. Many sailors for the British navy used to be recruited from the island. Heligoland means "Holy Land;" it was sacred to the goddess Hertha, but the population was converted by St. Willibrod in the 7th century.

Heligoland, BATTLE OF, an action fought off Heligoland on May 9th, 1864, between, on the one hand, two Austrian frigates and three Prussian gunboats under Commodore Tegethoff, and, on the other, three Danish frigates under Commodore Svensen. The allies got slightly the worst of it, and ended the battle by taking refuge in neutral waters.

Heliocentric, in astronomy, is a term expressing a reference to the sun as the central body from which distances, etc., are measured. Such reference is often more convenient than the *geocentric*, which regards the earth as the standard position for measurement.

Heliodōrus, a Greek writer of the third century, was born at Emesa. He wrote a romance of some literary power called *Æthiopica*, the subject of which was the loves of Theagenes and Chariclea, which has been edited by Bekker and Heischig.

Heliogabālus, or ELAGABALUS, Emperor of Rome, was one of the worst who wore the purple. He derived his name from the sun-god Elagabal, whose high priest at Emesa he was, but on the

death of Caracalla was set up by the soldiers against Macrinus, and upon the defeat of the latter in 218 became emperor. After a reign stained by every kind of cruelty and folly the prætorians rose against him and murdered him in 222.

Heliograph, or HELIOSTAT, is an instrument for flashing messages from one point to another by means of sunlight reflected from a mirror. Its chief applications have been to military tactics. Signalling has been effected through a distance of 190 miles in California and 170 miles in Algeria.

Heliolites. [HELIOPORIDÆ.]

Helimeter, an instrument due originally to Savery and Bouguer, and improved a century later by Dollond and Fraunhofer, its purpose being to measure the angular diameter of the sun, or any other heavenly body with an appreciable disc, or the angular distance between any two bodies near each other. One form consists of an object-glass cut into halves; each half gives a separate image of the heavenly body, but as the halves are made to slide apart the images draw nearer to each other and ultimately coincide. The distance apart of the two halves measures the required angular distance.

Heliopolis, "the City of the Sun," called by the Egyptians On, was situated on the most eastern branch of the Nile near Pelusium. It was the chief of the sacred cities of Egypt. To it Solon and Plato are said to have resorted, and among the chief priests were Manetho and Potiphar. Near it is still to be seen an obelisk called Pharaoh's Needle, and Cleopatra's Needle was also originally here. This place is not to be confounded with Baalbec or Syrian Heliopolis.

Helioporidæ, a family of Alcyonarian (q.v.) corals popularly known as the "Blue Corals" from their fine azure blue colour. The skeleton is calcareous, and is formed of a series of tubes of two sizes. Each set are inhabited by polypes of different structure, so that the colony is dimorphic. The larger tubes especially are crossed by tabulæ or horizontal plates, and have septal plates running along them. The latter are usually twelve in number in each tube, and have no relation to the mesenteries. They are really foldings of the walls, and are known as pseudo-septa. The smaller or "cœnenchymal" tubes contain rudimentary sexless polypes. The only genus in the family is *Heliolites*, which forms round lobed masses. It lives in the Indian and Pacific Oceans. The Silurian genera *Heliolites*, *Plasmopora*, etc., are probably also members of this family. They are tabulate, and consist in the same way of masses of large and small cœnenchymal tubes.

Helios, the Sun, was worshipped by the Greeks as a god. Homer makes him the son of Hyperion and Theia, and the brother of Selēne, the Moon. He rises from Oceanus in the morning to give light to gods and men, and falls into it again in the evening. Later writers placed his residence at Colchis, whither he was conveyed back after the toils of the day in a golden flying boat. Helios

afterwards became almost identical with Phœbus in the minds of poets. Rhodes was the chief seat of his worship, and Sicily (Trinacria) was also sacred to him. White lambs and boars were offered to him.

Helioscope, a telescope with darkened glass, through which the sun may be observed without injury to the eyes.

Heliotrope. [BLOODSTONE.]

Heliotrope, **HELIOTROPIMUM**, a genus of small plants belonging to a tribe closely related to the Boragineæ. They are hairy; have scattered leaves, small lilac, blue or white flowers in scorpioid spikes, with the polysymmetric pentamerous calyx, corolla and stamens and two deeply-divided carpels characteristic of the borage family. They are natives of the tropical and sub-tropical regions of both hemispheres, some occurring in Europe, and 23 species in Australia, whilst the favourite "cherry-pie" of our gardens is *H. peruvianum*.

Heliotropism, in vegetable physiology, is the response of the plant to the directive influence of light. Light has in general a retarding influence upon growth, so that illuminated parts grow more slowly than those in shadow. From the unequal growth thus caused curvature results, which is more marked when the light is more intense. The effect is produced mainly by light between the violet and ultra-violet of the spectrum, but even the dark ultra-red rays have some effect. Among radially symmetrical organs, such as axes, stems are generally *positively heliotropic*—bending, that is, towards the light, as seen in plants growing in a window, owing to the more rapid growth on the shaded side—while roots are mostly *negatively heliotropic*. A reversal of direction in one organ is exemplified in the flower-stalk of *Linaria Cymbalaria*, the ivy-leaved toad-flax, which in the flower stage is positively heliotropic and so droops, and in fruit becomes negatively so and erect. Vertical or bilateral organs, such as the leaves of *Iris*, are positively heliotropic. Dorsiventral organs, such as most leaves, exhibit what is termed *dia-heliotropism*, placing their dorsal surfaces at right angles to the direction of incidence of the light.

Heliozoa, a class of Rhizopoda (q.v.) which have stable pseudopodia which rarely branch or anastomose. They possess a contractile vacuole (q.v.), but no central capsule separating the external from the internal portion of the protoplasm. They resemble the Radiolaria (q.v.) in the first character, and also in the occasional presence of siliceous spicules. The absence, however, of a central capsule shows that they are simpler in organisation than these. The majority are inhabitants of fresh water. The best-known type is *Actinophrys sol*, a common fresh-water organism less than a thousandth of an inch in diameter. The shell is the main character used in classification. There are four groups: the Aphrothoraca, without any skeleton, e.g. *Actinospermum*, the Chlamydomphora, with a loose gelatinous skeleton, the Chalarothoraca, with a skeleton of loose siliceous spicules, e.g.

Acanthocystis, and finally the Desmothoraca, with a globular siliceous shell pierced by apertures, e.g. *Orbulinella*.

Helix, the type genus of the *Helicidae*. [SNAIL.]

Helix, or SPIRAL, is a curve of much interest in mathematics. It is traced out by a moving point that combines a rotation about an axis with a rectilinear movement in a line parallel to the axis. An ordinary screw-thread affords an example of the regular helix. The amount of onward motion in the direction of the axis that is produced in one complete rotation is called the *pitch*. Thus if a screw of $\frac{1}{8}$ -inch pitch, penetrating a piece of wood, is given one complete revolution it advances $\frac{1}{8}$ inch, and proportionately less for any fraction of a revolution. This uniformity of advance shows that the spiral can be produced by wrapping a triangular slip of paper round a cylinder.

Hell, in the Authorised Version of the New Testament, translates three different words—*Hades*, *Gehenna*, and *Tartarus* (2 Peter ii. 4), which has the same meaning as *Gehenna*. *Hades* is the word used in the Septuagint to render the Hebrew *Sheol*, the gloomy region into which all men pass after death. It was only during the Captivity that the Jews came to distinguish between *Paradise*, the abode of the virtuous, and *Gehenna*, that of the wicked. Much misconception has arisen through the employment of the same word to render Hades and Gehenna. This was probably due to the anxiety of the translators to avoid the appearance of giving any support to the doctrine of Purgatory. The orthodox Protestant view was that every soul passed immediately on death into a state of everlasting bliss or torment, and it was only with the latter of these that either Hades or Gehenna could be identified. The materialistic conceptions regarding the future place of punishment which grew up in the early Church, and are by no means extinct at the present time, were based on the words used by Christ in His allusions to Gehenna. But there can be no doubt that His language was figurative, and it is now generally agreed among divines, as more consonant with the teaching of Christianity, that the anguish suffered by the wicked after death is of a spiritual rather than a physical character. As regards the larger question of the possibility of salvation after death, the doctrine that there is no intermediate state between those of the redeemed and the damned, and that the judgment once passed on the dead soul is final, is still regarded as the orthodox Protestant view. But it is very doubtful whether this doctrine can be established even by a literal translation of the sacred text, and many eminent Christians have found it extremely repugnant to their moral sense. The words of the Saviour to the crucified robber distinctly point to an intermediate state; and it is by no means certain that *aiōnios* denotes "eternal" punishment; on etymological grounds, at any rate, it should rather mean "lasting for an age" or "for ages." Origen, in the 3rd century, put forward the doctrine of "Universalism," which teaches that all men will

finally be saved; it was at least regarded with favour by St. Jerome, and in modern times has received the assent of many eminent theologians.

The doctrine that Christ "descended into hell," accepted by the Church in the Creed and in the Third Article of Religion, has been interpreted in several different ways. It is founded mainly on 1 Peter iii. 19 (*cf.* Ephesians iv. 9; Acts ii. 27-31). It was taught by Ignatius, Hermas, and other early Fathers. The general view of the Christian Church on this difficult point is that the "soul" is the spirit or rational part of Christ—that which the Jews could not kill—and that "hell" is the place of departed spirits.

Helladotherium, a genus of extinct ruminants, intermediate between the Cervidæ and Bovidæ, but, like the giraffe (q.v.), more nearly related to the former. Its remains have been found in the older Pliocene rocks of Pikermi in Attica, of S. France, and of the Siwalik Hills in India.

Hellebore, a name applied by the Greek herbalists to two very different groups of medicinal plants, the "black hellebores," so called from the dark colour of their rhizomes, belonging to the ranunculaceous genus *Helleborus*, and the "white hellebores," belonging to the liliaceous *Veratrum* (q.v.). The species of *Helleborus* are herbs with pedate or palmate radical or cauline leaves; five persistent and often petaloid sepals, generally green, white, or red; the same number of small, deciduous, tubular green petals, serving as nectaries; numerous stamens, arranged spirally; and a circle of carpels slightly united at their bases, and forming follicles in the fruit stage. *H. viridis*, the green hellebore, with yellowish-green sepals, and *H. fetidus*, the stinking hellebore or bear's-foot, with its green sepals splotched with dull red, are natives of England. *H. niger*, the Christmas rose, with dark green foliage and spreading white or pink flowers, is a native of central and southern Europe, now much grown in our gardens. *H. orientalis*, a native of Asia Minor, with a more separable cortex to its woody rhizome, is probably the drug used by the ancients. The hellebores contain the poisonous glucosides *helleborin*, $C_{36}H_{42}O_6$, and *helleborein*, $C_{26}H_{44}O_{15}$. The rhizome of *H. niger* is poisonous, rubefacient, and vesicant when fresh, and emetic, purgative, and sternutatory when first dried, but afterwards losing its purgative property. Death ensues from poisonous doses, as from those of Digitalis, from paralysis of the heart. The tincture is used in dropsy; but both this species and *H. fetidus* and *H. viridis* are now chiefly employed in veterinary practice. Greek and Roman writers attributed to "hellebore" an efficacy in cases of insanity.

Helleborin, a body of the class of compounds known as *glucosides* (q.v.), which occurs in the roots of the Black Hellebore and some other plants. It forms shining white crystals insoluble in water, and possessing a burning taste. It has the composition $C_{36}H_{42}O_6$, while a closely-related substance, Helleborein, of composition $C_{26}H_{44}O_{15}$, also occurs in the same sources.

Helleborine, the English name of plants belonging to the two Orchidaceous genera *Epipactis* and *Cephalanthera*. Three species of the latter and two of the former occur in Britain.

Hellenists. (1) Greeks (Hellenes) or foreigners who became Jewish proselytes. (2) Jewish settlers in foreign lands who adopted the Greek language and the Greek manner of life, then everywhere current, while they clung to Hebrew tradition, and retained the Hebrew cast of mind. The word is translated "Grecians" in the Authorised, and "Græcian Jews" in the Revised Version. The opposition between "Hebrews" and "Hellenists" in the early Church at Jerusalem is mentioned Acts vi. 1; *cf.* ix. 29. Alexandria was the great commercial centre in which the Hellenistic spirit received its fullest development. Here arose the dialect called Hellenistic Greek, in which Hebrew terms of thought appeared clothed in a Greek dress, thus giving rise to what was practically a new language with its own peculiarities of vocabulary, idiom, and construction. A literary monument of Hellenistic Greek is preserved in the Septuagint version of the Old Testament. The speculations of Hellenistic philosophers such as Philo (q.v.) exercised much influence over Christian thought, and gave rise to many heresies. This application of the term "Hellenism" must not be confused with its use to denote Greek life generally under the monarchies succeeding Alexander the Great, when much of the East and Egypt became predominantly Greek in speech though not in population.

Heller, STEPHEN (1815-88), a brilliant pianist and composer for the pianoforte, was born at Pesth. He went to Augsburg to complete his musical education, where he stayed eight years, and then went to Paris in 1838. Heller composed many études, preludes, tarantellas, and small pieces of great delicacy.

Helm, the apparatus by means of which a ship is steered. It includes, in large ships, the rudder, the tiller, and the wheel, and in small craft the two former only. The term helm is applied more particularly to the tiller; "starboard the helm" means "bring the tiller over to the right side of the ship." To "put the helm down" is to push the tiller to the lee side, so as to put the vessel about, or lay her to the windward.

Helmet. In heraldry, distinctions of rank are denoted by the metal of the helmet, the number of bars in the vizor and the position.

Helmholtz, HERMANN LUDWIG FERDINAND VON, a distinguished German physician and scientific writer, born in 1821. He was educated for the medical profession, and practised as a surgeon at Berlin and Potsdam. After having been an assistant in the Berlin Anatomical Museum, he held the chair of physiology at Königsberg, Bonn, and Heidelberg successively, and in 1871 was appointed professor of physics at Berlin. His work in physics and in physiology is equally valuable. To the first belongs his essay on the *Conservation of Energy* (1847), also his analysis of

the spectrum. In physiology he has devoted himself chiefly to physiological optics and the connection between sight and sound. He invented an instrument with which the retina of the living eye can be studied, and wrote *Theory of Sound Sensations* (1862), and *Sensation of Tone as a Physiological Basis for the Theory of Music* (trans. 1875). Besides this he made investigations on the subject of nerve disturbances, vibrations of air in pipes, and the relation between colour and sound. The English translation of his *Popular Scientific Lectures* (*Vorträge*) has an introduction by Tyndall.

Helmont, JEAN BAPTISTE VAN (1577-1644), a great Belgian chemist, was born at Brussels and educated at Louvain. Before his marriage in 1605 he travelled in England, France, and Switzerland. Four years afterwards he settled down to a life of study at Vilvorde, his estate near Brussels. Throughout his life he wavered between science and mysticism, and was in early life deeply religious, both studying and putting into practice the teaching of the *Imitatio Christi*. This was succeeded by an absorption in Paracelsus and a devotion to alchemy and chemistry. Van Helmont's contributions to the latter were his distinction between various gases, his insistence on the employment of the balance with the demonstration of its consequences, and his investigation of human fluids. He is said to have been the first to employ the term "saturation" and to use boiling-point and melting-point as measures of temperature. Many editions of his works have been printed, and in 1868 a book by Rommelaere, *Études sur Van Helmont*, was published at Brussels.

Heloderm, either of the two species of *Heloderma*, from western America. These lizards are the only ones known to be poisonous. Their bite soon kills birds and small mammals, but is rarely fatal to man. The wart-like scales are orange and black.

Héloïse. [ABELARD.]

Helots, the serfs who formed the lowest grade in the Spartan population, consisting originally of the Achæan landowners who had been enslaved by the Doric invaders. In many respects they resembled the mediæval villeins—*e.g.* they worked for individual proprietors, to whom they paid a fixed rent in kind, and they could not be sold away from the land to which they were bound. They belonged to the state, which alone could grant them freedom. In war they usually served as light-armed troops, but occasionally they were enrolled as a part of the regular army. They were very cruelly treated, and the murder of Helots was one of the duties entrusted to the "secret commissions" of Spartan youths.

Helps, SIR ARTHUR (1817-75), a popular essayist, was born at Streatham. After having been private secretary to Mr. Spring Rice and Lord Morpeth, he was in 1860 appointed clerk to the Privy Council. His *Essays Written during the Intervals of Business* appeared in 1841, and *The Claims of Labour* in 1844. The first series of

Friends in Council, a discussion of various social and literary subjects in the form of a dialogue, was published in 1847, and was succeeded in 1859 by a second series. This author also wrote *The Spanish Conquest of America* (1855-61), and biographical studies in similar subjects, some novels (*Iran de Biron*, etc.), and some plays of inconsiderable merit. His last book, *Social Pressure*, was published in 1875.

Helsingfors, the capital of Finland, is situated on a peninsula in the Gulf, in lat. 60° 10' N. and long. 25° E. Its founder was Gustavus I. of Sweden, by whom it was placed on a site somewhat farther inland than the present town. In 1819 it became the capital of the duchy. Though it has now for a century been in Russian hands, Swedish is still spoken in the town. Helsingfors is protected by the fortifications of Sveaborg, consisting of a line of batteries a mile long on seven islands at the entrance to the harbour. These were bombarded for two days by the Allies in 1855, and the impression as to their strength was confirmed. Helsingfors is a handsome town, with a senate-house, diet-house, three fine churches, and some university buildings. The university was removed hence from Abo in 1828, and has upwards of 1,500 students and more than 40 professors. It has a large library, the remains of that which was burnt at Abo, a hospital, and a good observatory. The town is also important commercially as a Baltic port, and exports large quantities of timber. It is much resorted to by the inhabitants of St. Petersburg as a bathing-place.

Helvellyn, a mountain on the borders of Westmoreland and Cumberland, nearly midway between Keswick and Ambleside, 3,118 feet in height. It is easily climbed.

Helvetia Green, also known as ACID GREEN, a fine green organic dyestuff, derived, like many other colour materials, from triphenyl methane ($C_6H_5)_3CH$.

Helvetii, a Keltic people whose territory—consisting of four "pagi" or cantons—was almost identical with the modern Switzerland, being bounded by the Jura on the west, the Rhine on the north and east, and the Rhone and the Lake of Geneva on the south. Their attempt to subdue Southern Gaul is narrated by Cæsar in his *Gallie War* (bk. i. chaps. 1-29). After burning their towns and villages and collecting supplies sufficient for three months, they assembled at the Lake of Geneva, but Cæsar blocked their way by building a wall along the Rhine, and afterwards defeated them in a great battle at Bibracte, the chief town of the Ædui (58 B.C.). The survivors were sent back to their own country, and became subject to the Romans. In the 1st century A.D. they were almost exterminated by one of Vitellius' generals in consequence of their adhesion to Galba.

Helvétius, CLAUDE ADRIEN (1715-71), French philosopher, was born in Paris, and was a son of a doctor who had attended both Louis XIV. and Louis XV. He was trained to be a financier, and from 1738 to 1750, when he resigned, held a

farmer-generalship. His thoughts, however, early turned to philosophy and literature, and even as a boy he was a student of Locke. Though he held the post of chamberlain to the queen, he was but seldom at court, and passed the last twenty years of his life almost entirely at his estate at Voré, in La Perche. He was a popular landlord, and did many kind acts, especially relieving those who had been ruined by the exactions of the farmers-general. As one of the Encyclopædists he was intimate with Voltaire, Diderot, and D'Alembert, and was fond of getting up what he called an idea-hunt (*chasse aux idées*) by propounding to a company of his friends some startling paradox. He visited England and Prussia a few years before his death. His chief work was called *De l'Esprit*, and appeared in 1758. Another work, *De l'Homme*, was published a year after his death. Editions of his collected works appeared in 1796 and 1818.

Helvine, or **HELVITE**, a mineral which forms lustrous regular crystals of a yellow or green colour, specific gravity 3·8, hardness 6. It consists of the silicates of iron, manganese, and beryllium with a sulphide of manganese, and is interesting both as a compound of the rare element beryllium, and as the only known natural compound of a silicate and a sulphide.

Hemans, **FELICIA DOROTHEA** (1793–1835), a writer of English verse, was the daughter of a Liverpool merchant named George Browne. She was brought up at Gwrych, North Wales, and a quarto volume of her poems was published when she was fourteen. Shelley wished to correspond with her, but her parents refused to allow him, and three years after the publication of her *Domestic Affections* (1812) she married Captain Hemans. They had five children, but in 1818 a separation took place. Next year she published *Translations from Camoëns and other Poets*, which was followed by *The Sceptic* (1820), a prize poem on Dartmoor, *Welsh Melodies* (1822), and *The Vespers of Palermo*, a tragedy produced without success at Covent Garden in 1823. In 1825 appeared *Lays of Many Lands* and *The Forest Sanctuary*, in the second edition of which (1829) *Casabianca* was included. In 1829 she went to Scotland and made the acquaintance of Sir Walter Scott, and in the same year met Wordsworth during a visit to the Lakes. Her last four years were spent in Dublin, where she knew Whately and Blanco White. Her *Hymns for Childhood* were first published in America, where her works were very popular. A memoir of Mrs. Hemans by her sister, Mrs. Hughes, was prefixed to the first collected edition of her works.

Hemelytra, the anterior wings of the Heteroptera (q.v.), so called because half are thickened to form elytra and half remain as membranous flying wings.

Hemianopia, **Hemiopia**, the condition in which the corresponding halves of the two retinas fail to convey the impression of sight to the central nervous system, in consequence of which only one half of an object to which the gaze is directed is

visible. This rare symptom occurs in some cases of tumour within the brain.

Hemicrania. [MEGRIM.]

Hemimetabolic Insects are those in which the metamorphosis is "incomplete"—i.e. the pupa is active, so that the caterpillar and imago stages are not sharply marked off by a resting chrysalis stage.

Hemimorphite, or **SMITHSONITE**, the mineral hydrous silicate of zinc ($2\text{ZnSiO}_3 + \text{H}_2\text{O}$), a valuable ore of zinc, crystallises in the Prismatic system, often in hemihedral twins of the rhombic prism, with perfect crystalline cleavage, but also occurs massive, granular, fibrous, or stalactitic. It varies from transparency to opacity, from white to yellowish brown, and from adamantine to vitreous or subpearly lustre. Its hardness is 4·5 to 5, its specific gravity 3·16 to 3·5, and it is thermo-electric. Before the blowpipe it is almost infusible, but it turns green with cobalt-nitrate. In the matrass it decrepitates, whitens, and gives off water. It gelatinises with acids, and dissolves in strong caustic potash. It is found with calamine (q.v.) in the Mendip Hills; at Matlock and Castleton, Derbyshire; Alston Moor, Cumberland; Leadhills, Lanarkshire; Aix-la-Chapelle; Schemnitz in Hungary; and various places in the United States.

Hemiplegia. [PARALYSIS.]

Hemiptera. [RHYNCOPTA.]

Hemlock (*Conium maculatum*), a poisonous biennial plant belonging to the Umbelliferae, is a not uncommon hedge-row plant in the British Isles. It grows from three to five feet high, erect and



HEMLOCK (*Conium maculatum*).

branching, and is most readily recognised by the dark purplish spots on its smooth, hollow stems and its strong, mouse-like smell. The leaves are tri-pinnate, and, in addition to the general involucre, the compound, many-rayed umbels of small white flowers have involucels of three short

bracteoles all on one side, the outer side, of the peduncle. The fruits are broadly ovate, splitting into mericarps, each having five crenate projecting ribs, but no oil-vittæ. These fruits, and, to a less extent, the leaves, contain the poisonous alkaloid *coniine*, $C_8H_{15}N$, which is similar in its action to nicotine. Hemlock is chiefly employed as an extract or tincture, acting as a sedative or antispasmodic; but large doses produce giddiness, nausea, and paralysis. Many allied umbelliferous plants are commonly confused with hemlock.

Hemlock-spruce (*Tsuga canadensis*) is a conifer related to the spruces (q.v.), native to the north-east of North America, where it is often called simply the "hemlock." In New Brunswick and Nova Scotia it is often the predominant species. It prefers dry, mountainous woods, and often reaches a girth of nine feet. The wood is crooked in grain and liable to warp, and is not, therefore, of much value. The main branches droop elegantly. The shoots are used for spruce-beer. The leaves are short, flat, light green above and whitish below, resembling those of fir adpressed on the stem, and distichous on the twigs. The cones are small, ovate, and pointed, resembling, but much smaller than, those of the true spruces, *Picea*. The bark is stripped off in May and June, and, either unprepared or as an extract, is largely used in tanning. The tree also yields the slightly stimulant Canada pitch, a substitute for Burgundy pitch.

Hemp (*Cannabis sativa*), an annual plant, which, like the hop (q.v.), belongs to the Cannabinaceæ, a sub-order of the Urticaceæ, and has been employed as a fibre, and as a source of a medicinal and intoxicating resin from very ancient times. The hemp plant is probably a native of temperate Asia, near the Caspian. It is dioecious, the female plant being the larger, and reaching to 10, or even 17 feet in height. The leaves consist of from five to seven lanceolate-acuminate leaflets with serrate margins, arranged palmately. The male flowers are in loose panicles, the female ones in short spikes. Hemp is cultivated in Suffolk and Lincolnshire and in Ireland; but chiefly imported from Russia, Germany, Italy, and the United States, to London, Liverpool, Hull, and Leith. In the official returns various other fibres, such as Manilla hemp (q.v.) from the Philippines, Suna hemp (q.v.) from India, and Pita fibre (q.v.) from Mexico, are included under hemp. Hemp is used for all kinds of cordage, sacking, canvas, and sail-cloth. The preparation of the fibre is similar to that of flax (q.v.). Hemp-seed, which really consists of small nuts or fruits, is used as a food for cage-birds, and contains 34 per cent. of a drying oil, inferior to linseed oil. The oil-cake is purgative. As a drug or intoxicant hemp is used in enormous quantities in the East under the three forms: *bhāṅg*, the dried leaves and twigs, *ganja* or *quaza*, the flowering and fruiting clusters, and *churrus*, the exuded resin itself. *Hashish* is a preparation of ganja or bhāṅg with butter. The chemical characters of the resin are imperfectly known. It acts on the nervous system, producing exhilaration and appetite in small doses, hallucinations and even catalepsy in larger ones.

It has been employed as an antispasmodic and anodyne in tetanus and hydrophobia.

Hems, or **HOMS**, a city in Syria, situated on the right bank of the Orontes 63 miles N.E. of Tripoli, is the ancient Emesa, where Aurelian defeated Zenobia, Queen of Palmyra, in 272. The Saracens captured it in the 7th century, and in 1098 it fell into the hands of the Crusaders. The site of the ancient Temple of the Sun is probably that now occupied by the castle. Silk goods and gold wares are made, and a trade in oil and sesame is carried on.

Henbane (*Hyoscyamus niger*), a poisonous annual or biennial plant belonging to the nightshade family, occurs wild on rubbish-heaps and waste ground in Western Asia and Europe, including Great Britain. The biennial form is also cultivated as a drug. The whole plant is covered with viscid hairs, and has a disagreeable smell. The flowers have a persistent campanulate calyx with five lobes, a monosymmetric cream-coloured corolla veined with purple, giving it an unwholesome lurid appearance, and five stamens, and are succeeded by a many-seeded pyxidium (q.v.). The leaves and seeds contain the alkaloid *hyoscyamine* ($C_{18}H_{28}N_2O_3$), which differs from atropine mainly in being more soluble. The extract or tincture is a valuable anodyne.

Hengist ("horse") and **Horsa** ("mare") were, according to Bede and the *Anglo-Saxon Chronicle*, the names of the two leaders of the first Teutonic invaders of Britain. They are said to have landed at Ebbsfleet in 449 or 450 to assist Vortigern, a British prince, against the Picts, and to have received Thanet as the reward of their successes, but afterwards to have turned their arms against him. Horsa was slain at Aylesford in 455, but Hengist and his son afterwards conquered Kent. Their names are not, however, mentioned by Gildas, and it is by no means certain that any such persons existed.

Hengstenberg, ERNEST WILHELM (1802-69), a German theologian of the orthodox school, was born at Fröndenberg, Westphalia. While studying philosophy and Oriental subjects at Bonn, he also took great interest in the Burschenschaft movements. It was at Berlin in 1824 that he first adopted the orthodox position. In 1826 he became extraordinary, and two years later ordinary professor of theology at that university. His reactionary *Evangelische Kirchenzeitung* was begun in 1827. Most of his works have been translated into English, amongst them being *Die Bücher Moses und Aegypten* (1841), and commentaries on the Psalms, St. John, and the Apocalypse. Hengstenberg opposed the union of the Lutheran and Reformed Churches, and attempted to obtain the removal of Professors Gesenius, De Wette, and other Rationalists and so-called Rationalists from their chairs.

Henley, a town on the Oxfordshire bank of the Thames, 8 miles N.E. of Reading, and 24 miles S.E. of Oxford. The river here is crossed by a bridge with five arches, which was erected in 1786. The

grammar school dates from the early years of the 17th century. Brewing and malting are carried on, and there is a large trade in corn and timber. The first Henley Regatta was held in 1839.

Henna, the "camphire" of the Bible (Song of Solomon i. 14; iv. 13), is the Levantine shrub *Larsonia alba*, belonging to the order Lythraceæ, which is also known in England as "Egyptian privet," and in the West Indies, where it has been naturalised, as "Jamaica mignonette." Its older branches become spinous: its leaves are opposite, oval and entire; and its small flowers are in panicles, very fragrant, and have each four petals and eight stamens. The leaves and twigs are pulverised and made into a paste with hot water, and this is used by Mohammedan women from India to Egypt to dye their nails, palms and soles, of an orange-red. The dye was used by the ancient Egyptians, as is shown by their mummies, and is said to have been used by Mohammed for his beard, a custom still followed by men in Persia. The manes of horses are also sometimes stained with it, and it is used in dyeing leather, though not lasting. Its use on the hands and feet is said to check perspiration.

Henrietta Maria, QUEEN OF ENGLAND, was the youngest daughter of Henry IV. of France. She was born in 1609, and in 1625, when the Spanish match had failed, she married Charles I. By the marriage treaty it was agreed that she should be free to exercise her religion. The provision was obnoxious to the English Puritans, and the way in which the privilege was abused caused great trouble to the king. The queen exercised little influence, however, till after the death of Buckingham. She and her coterie are generally thought to have urged Charles to attempt the arrest of the Five Members, and to have finally induced him to sign the Bill of Attainder against Strafford. On the outbreak of the Great Rebellion she took the crown jewels out of the country in order to raise money on them, and on her return shared her husband's fortunes till 1644, when she returned to France, where she lived till the Restoration. She had been impeached by Pym in 1643, but the proceedings were dropped. During the first five years of the reign of Charles II. she resided at Somerset House, the rest of her life being passed in her native France, where she died in 1669.

Henry I., KING OF ENGLAND, youngest son of William I., was born in 1068. He was carefully educated, and attained such a degree of learning as to gain the surname of Beauclerc ("fine scholar"). Henry obtained the crown in 1100, partly by his own promptitude in seizing the royal treasure, but chiefly by the influence of the Earl of Warwick and Anselm. The absence of Robert in Palestine was also in his favour. Before his coronation he swore to maintain peace, to abolish the wrongs committed by the late king, and to deal justice with mercy, and soon afterwards he issued a charter, promising to maintain the privileges of the Church, the vassals, and the people. He then imprisoned Flambard, and invited Anselm back to England. To crown

all, he married Edith, niece of Edgar Ætheling, the last of the Saxon line. Robert, on his return from the crusade, claimed the crown, but was satisfied for the time with the Cotentin and a pension. He was too troublesome, however, as a standard round which the forces of feudalism might gather, to be let alone, and, after his defeat at Tenchebrai in 1106, was deprived of the duchy of Normandy. Henry had to put down four great feudal outbreaks. In 1102 the powerful Robert de Belesme was compelled to surrender his castle at Bridgnorth and to go into banishment. In 1104 another rising took place, and that of 1118 was aided by Louis VI. of France and Count Fulk of Anjou, who made use of the claims of Robert's son William. When the final movement of 1124 had been repressed Henry was at length at peace, and the rest of his years were occupied in administrative reform and the securing of the succession to Matilda, the king's daughter, his son William having been drowned in 1130. At the beginning of the reign the Investiture question had caused a breach between Henry and Anselm, but both had statesmanship enough to agree to a compromise. [ANSELM.] The most important feature of Henry's government was his formation of an official nobility, and the beginning of a regular system of royal justice by the sending round of royal officers to all parts of the country to inquire into abuses as well as to collect taxes; but a disputed succession gave feudal anarchy a last chance and interrupted the work which had been so well begun. Henry I. died in 1135.

Henry II., son of Geoffrey, Count of Anjou, and Matilda or Maud, daughter of Henry I., was born in 1133 at Le Mans. He came to England in his ninth year, but passed the next few years at the Scottish court. In 1151 he became Duke of Normandy and Count of Anjou, and next year by his marriage with Eleanor, divorced wife of Louis VII. of France, acquired Aquitaine and other territory in the south of France. At the end of the Civil War he returned to England, and by the Treaty of Winchester (1153) was acknowledged heir to the crown, to which he succeeded at the end of 1154. He took up the work of his grandfather, and with the help of Archbishop Theobald and other officials, especially Thomas Becket (q.v.) the chancellor, demolished the baronial castles, reformed the coinage and re-established order under the authority of the Crown. This chiefly occupied the first ten years of the reign: the next eight saw the Becket quarrel, the Assize of Clarendon (1166) and the conquest of Brittany. After the death of Becket Henry went to Ireland, which country was granted him by the Pope in 1172. During the next two years (1173-74) the last great feudal revolt took place. The nobles were supported by the Kings of France and Scotland and the Count of Flanders, as well as by Henry's own sons; but it was, nevertheless, unsuccessful. The great legislative acts of the Assize of Northampton (1176), an expansion of that of Clarendon; the Assize of Arms (1181), the basis of the military system, subsequently developed under Edward I. in the

Statute of Winchester, and the Assize of the Forest (1184), signalled the next period of the reign. Henry's last years were embittered by the ingratitude of his sons, who, though all generously provided for, continually intrigued against him and allied themselves with his enemies. Henry, the eldest, was crowned in 1170 but in 1174 acted with his father-in-law, Louis VII., in the great revolt, and in the year of his death (1183) again with Geoffrey took arms against his own father. Philip Augustus, the new King of France, aided Henry's younger sons, and Henry was at war with them when in July, 1189, he died at Saumur. [BECKET.]

Henry III., son of King John and Isabella of Angoulême, was born in 1207, and succeeded to the throne in 1216. William Mareschal, Earl of Pembroke, up to 1219, and afterwards Archbishop Langton and Hubert de Burgh strengthened the hands of Henry during his minority. The Great Charter was renewed, the alien Papal legates (*legati a latere*) were withdrawn from the realm, and the foreign mercenaries were dismissed. In 1232 the Regency closed, and for two years the king was in the hands of Peter des Roches, the Poitevin Bishop of Winchester. Even after his dismissal foreign influence was predominant, and in 1236 gained fresh ground when Henry married Eleanor of Provence. The extent to which this grew led to the formation of a baronial opposition, the clergy also joining in the movement on account of the Papal exactions. It was not, however, till 1252 that a great leader appeared in the person of Simon de Montfort (q.v.), himself a foreigner, who had married the king's sister and acquired the earldom of Leicester. In 1258 things came to a head in the Mad Parliament, which entrusted the real government to a committee of barons. Before long the latter broke up into sections and in 1261 the king regained power. In 1263 the Barons' War broke out, and De Montfort having been victorious at Lewes summoned an assembly in 1265 in which burgesses as well as knights of the shire were invited to sit. Prince Edward, Henry's son, soon, however, escaped, and was joined by the part of the baronage who were jealous of De Montfort; and at Evesham the latter was defeated and slain. During the rest of the reign the influence of Prince Edward, who was a constitutionalist, but unwilling to submit to baronial dictation, was supreme. Henry III. died in 1272, after a reign of fifty-six years. During this long period the first conception of a Parliament, or non-feudal assembly, first appeared, the Friars established themselves in England, and the University of Oxford became an influence in national life. [MONTFORT, HUBERT DE BURGH, GROSSETETE, etc.]

Henry IV. was the eldest son of John of Gaunt, Duke of Lancaster, and was born at Bolingbroke, Lincolnshire, in 1366. By his first marriage he acquired the Hereford property, and in 1385 was created Earl of Derby. He was one of the five Lords Appellant who, in 1381, impeached the ministers of Richard II., but afterwards supported that king. In 1398, however, he was banished for

ten years, the king probably thinking the quarrel with Norfolk a good opportunity of getting rid of two such powerful nobles. Next year Richard confiscated the Lancaster estates, and the new duke, relying on his popularity, returned to claim them. He was so well received that he found it not difficult to obtain the deposition of Richard and the offer of the crown to himself. He conciliated the Church by the statute *De Hæretico Comburendo* (1401), and defeated and captured Douglas, the great Scottish captain, in the following year. In 1403 he defeated a combination of the Percies and the Scots at Shrewsbury before their Welsh ally was able to join them. Two other risings were crushed later in the reign, and after the last (1408) Henry was able to intervene in the affairs of France, where he supported alternately the Burgundians and Armagnacs according as he found it to his advantage. In 1406 the heir to the Scottish crown fell into his hands, and was kept a prisoner. Henry IV. was twice married, and three of his sons by Mary Bohun, his first wife, played important parts in English history. This king died in 1413. His reign was the high-water mark of parliamentary power under the Plantagenets, owing to the weak position of the king and his financial necessities. [HOTSPUR, GLENDOWER, LOLLARDS.]

Henry V., eldest son of Henry IV., was born at Monmouth in 1388. He displayed great military ability during the reign of his father, but the jealousy of the latter appears to have excluded him from political influence. He came to the throne in 1413, and just as he was setting out to prosecute his claim to the crown of France had to punish a conspiracy in which Richard, Earl of Cambridge, his kinsman, was involved. He sailed from Southampton in August, 1415, and, after besieging Harfleur and losing two-thirds of his army chiefly by famine and disease, set out on that perilous march to Calais which ended in the victory of Agincourt (q.v.) (October 25, 1415). A naval victory followed in the next year, and in 1419 an alliance with Burgundy was concluded. The result was the Treaty of Troyes, by which Henry, as husband of the Princess Catherine, was acknowledged heir to the crown of France and Regent during the life of her father, Charles VI. The Dauphin and the Armagnacs refused to submit, but were defeated. Henry died in August, 1422, while advancing against them. Henry V. was the most popular of English kings. He went still farther than his father in his repression of Lollardism, and this policy was generally approved. The stories of his early life, though not historical, are by no means wholly to be rejected. [AGINCOURT, LOLLARDS.]

Henry VI., eldest son of Henry V., was born at Windsor in 1421, and was titular king before he was a year old. The Regency was in the hands of his uncle, the Duke of Gloucester, but his great-uncle Henry, Cardinal Beaufort, also exercised great influence. Another uncle, the Duke of Bedford, was entrusted with the conduct of affairs in France, where the centre of interest of the first period of the reign lies. Bedford maintained the alliance with Burgundy for some years, but was much

hampered by the ambition of Gloucester. In 1420 Joan of Arc (q.v.) raised the siege of Orleans, and after this, though Bedford won a great victory at Vernenil in 1424, the tide turned against the English. Though Joan was captured and put to death in 1430, the Treaty of Arras healed French dissensions, and the wise leadership of Bedford was lost soon after. In 1444 a truce between England and France was made, and was followed by the marriage of Henry VI. to Margaret of Anjou, a niece of Charles VII. Two years later both Beaufort and Gloucester died, and the government fell into the hands of Margaret and of the Earl of Suffolk who had negotiated her marriage. Their conduct of the war was distrusted, and in 1449 Suffolk was impeached and banished, but was beheaded on the high seas by a supposed pirate. In 1450 Normandy was lost, the rebellion of Jack Cade against the misgovernment of the nobles took place, and Richard, Duke of York, began to be prominent. The queen's favourite, was, however, the Duke of Somerset, and York became Regent of Ireland. From thence he returned and insisted on a reform in the Council, which was granted. In 1453 Guienne was lost, and in the same year the king showing signs of mental weakness, a struggle for the Protectorate began between Somerset and York. The latter was appointed early in 1454, but the king soon recovered. Next year the Wars of the Roses began, and after his victory at St. Albans York became again Protector for four years. The struggle was renewed in 1459, and York was attainted at Coventry by a Lancastrian Parliament. In the following year, however, he won a victory at Northampton, after which he claimed the crown; but the queen raised an army in the north, and at Wakefield the Duke was defeated and slain. The battle of Towton (March, 1461) put a period to the Lancastrian triumph, and Henry was dethroned and imprisoned. He was temporarily restored by Warwick ten years later, but after the final Yorkist victories of Barnet and Tewkesbury was put to death, as was popularly supposed, by the hand of the youngest son of the late Duke of York. [BEAUFORT, BEDFORD, CADE, GLOUCESTER, JOAN OF ARC, WARWICK.]

Henry VII., the first of a new dynasty, was the grandson of Owen Tudor, who married Henry V.'s widow, and of Margaret Beaufort, great-granddaughter of John of Gaunt. He was born in 1456, and was recognised by his half-brother, Henry VI. From 1471 to 1485 he lived in Brittany, the duke refusing to give him up to the Yorkists. In the autumn of 1485 he landed at Milford Haven with an army of English exiles, and on August 22 defeated Richard III. at Bosworth. He was recognised as king by an Act of Parliament, and early in 1486 married, as he had promised, Elizabeth, daughter of Edward IV. He refused, however, to allow her to be crowned until after the risings of Lovel and Lambert Simnel had shown him the importance of really conciliating the Yorkists. Although, as the last male of the House of Lancaster, he had been virtually acknowledged, he had no legal claim, since Katherine Swynford

was only the mistress of John of Gaunt, and her descendants had been barred from the succession by Act of Parliament. He was really king, then, by conquest, and had to maintain his position against various pretenders. The most dangerous of these was Perkin Osbeck, or Warbeck, supposed to be a Fleming, who, claiming to be a son of Edward IV., obtained the support of Burgundy and Scotland, and at first of France. In 1497 he appeared in Cornwall, but was unable to keep together his forces, and was captured. Two years later he was executed in company with the Earl of Warwick, son of Clarence, and a confession of imposture was published.

With Henry VII. begins that tendency to absolute monarchy which is only finally checked by the Revolution of 1688. Firm government and strict economy were the chief characteristics of his internal policy. He established the Star Chamber to put down the power of the nobles and especially the practice of maintenance, or the keeping of liveried retainers who backed their lord against all law and justice. The necessity for summoning Parliaments was obviated by the practice of levying benevolences, by heavy fines for breaches of actual and obsolete laws, and by money obtained from France in liquidation of English claims to the crown, in addition to that voted by the English Parliament for the war. In 1496 the "Great Intercourse," a commercial and political treaty, was concluded with Flanders. Moreover Poyning's Law (1495) first secured the supremacy of the English crown over the Irish Parliament.

In foreign affairs Henry aimed at securing the position of England by marriage alliances. He separated France and Scotland by giving the hand of his daughter Margaret to James IV. By the marriage of his son Arthur, and after his death of Henry, with the daughter of Ferdinand and Isabella, he maintained the traditional alliance with Spain, and he himself proposed to marry (as his second wife) the daughter of the Emperor Maximilian. This and other matches fell through; but England was left in a firm position at his death in 1509. A history of his reign was written by Francis Bacon.

Henry VIII. was born in 1491, and succeeded Henry VII. in 1509, his elder brother Arthur having died before his father. He began his reign by putting to death Empson and Dudley, the instruments of Henry VII.'s extortion, and entered upon a more active foreign policy. He joined the Holy League against Louis XII. of France, and defeated an incursion of his ally, James IV. of Scotland, at Flodden in the same year as the battle of the Spurs. At the peace which followed he received large sums in satisfaction of his claims, and gave his sister Mary in marriage to the French king. Another short war followed the accession of Francis I. (q.v.), and in 1519 Henry was a candidate for the Empire. From 1514-1529 Wolsey was Chancellor, and incurred all the unpopularity which the arbitrary means of raising money for the wars caused. For some years the alliance with the new Emperor, Charles V., who was nephew of Queen

Katharine, continued; but Henry and Wolsey, though inclining to him, really preferred holding the balance between him and Francis. Thus the meeting at Ardres, called the "Field of the Cloth of Gold," was allowed to take place as well as the visit of the Emperor to Canterbury. In 1523 peace was made with Scotland.

After the battle of Pavia and the sack of Rome, England changed sides, and in 1528 war was declared against Charles V. Meanwhile, however, Henry, not having a male heir, had begun to wish for divorce from Catherine, and when he fell in love with Anne Boleyn was determined to obtain it at all costs. The Pope, however, overawed by the Emperor, granted only a joint commission to examine the demand, and then revoked the case to Rome. Wolsey was now disgraced, and died in the following year (1530).

The Reformation, which had begun in the Parliament of 1529, followed. In 1531 the clergy, who had been brought under the penalties of *præmunire* for acquiescing in the legatine authority of Wolsey, had to purchase their pardon by acknowledging Henry as supreme head of the Church. Annates were in 1532 provisionally withdrawn from the Pope, Henry was married to Anne Boleyn in 1533, and appeals to Rome were made unlawful; and in 1534 a definite separation from the Papacy was completed. In 1536 the smaller monasteries were visited and suppressed, and in 1539 the larger houses shared the same fate. The abbots lost their places in the House of Lords, and most of the ecclesiastical property was granted to the new nobility. It was next made high treason to question the royal supremacy or the change in the succession, and Sir Thomas More and Bishop Fisher suffered death on the former ground. In 1536 Anne Boleyn was beheaded, and a new change was made in the succession, the king marrying Jane Seymour, by whom he at length had a male heir, afterwards Edward VI.

There was a great deal of discontent at the recent events coupled with the agrarian changes. Risings took place in Lincolnshire and Yorkshire (the "Pilgrimage of Grace"), but were put down. The king, however, was not prepared for the doctrinal changes which his Chancellor and Vicar-general, Thomas Cromwell, favoured, and he showed his displeasure on the occasion of the marriage, negotiated by the latter, with Anne of Cleves. In 1539 the Anglo-Catholic party, led by the Duke of Norfolk, had obtained the enactment of the Six Articles, making penal a refusal to accept the chief Romanist doctrines, and in 1540 Henry repudiated his fourth wife, and assented to a bill of attainder against Cromwell, who was executed.

The king now identified himself with the reaction by marrying a niece of the Duke of Norfolk, who in 1542, and for similar causes, shared the fate of Anne Boleyn. In 1543 Henry married Katharine Parr, who survived him. The remainder of the reign was occupied in wars with France and Scotland. The alliance with Charles V. was renewed in 1544, but was never, owing to late events, very cordial; and Henry, abandoned by his ally, made peace two years later, receiving the promise of a pension from France.

The Scots were unsuccessful in their raid in 1542, James V. being routed at Solway Moss; but the French still retained considerable influence in Scotland. Before the king's death the Protestant party gained influence over him, and Norfolk was imprisoned and his son beheaded in 1546.

Parliament had granted to the king the right of nominating his successor, so that when in 1547 Henry VIII. died the succession of his son was assured. Besides being politically able, he was a learned theologian, and it is probable that he really felt grave doubts as to the validity of the dispensation which allowed him to marry his brother's widow. [WOLSEY, CROMWELL, THOMAS MORE, REFORMATION.]

Henry III., "THE BLACK," Holy Roman Emperor, son of Conrad II., was born in 1017, and succeeded to the imperial dignity in 1039. His power was supreme both at home and abroad. He kept in his own hands the duchies of Franconia and Suabia, whilst the others were either left vacant or given to relatives, and his control over ecclesiastical fiefs was equally complete. Internal peace was maintained with the strong hand. In Rome the emperor was more absolute than any German prince had hitherto been. He deposed three Antipopes, and appointed Clement II. in 1042 to the Papal chair; and was granted the right of nominating future Popes by the Synod and the title of Hereditary Patrician. He also maintained his feudal superiority over Hungary, which he compelled to pay tribute. Henry III. died in 1056.

Henry IV. (son of Henry III.) was born in 1050, and was elected King of the Romans when a child. He was not crowned emperor till the year 1070; five years later at Hohenburg he avenged himself on the Saxon nobles for the humiliating terms he had been previously obliged to make with them, but his triumph was only for a time. In 1076 the great Investiture struggle began. Both Pope and emperor claimed a voice in the appointment of each other, and Gregory VII. declared it to be a sin for an ecclesiastic to accept any benefice under conditions made by a layman. Henry proclaimed the deposition of Gregory, who, in his turn, excommunicated him and declared his subjects absolved from their allegiance. The uncrowned emperor, finding himself without support in Germany, came to Italy in 1077, and obtained absolution, after standing barefoot and clothed only in a hair shirt for three winter days and nights in the courtyard of Canossa. The contest, however, was soon renewed; and the excommunication of Henry was answered by the nomination of a new Pope, by whom, after Rome had been captured, Henry was at length crowned. Gregory took refuge at first in San Angelo, and afterwards with Robert Guiscard, and the emperor was, for the time, victorious. He now, however, had to deal with fresh trouble in Germany, caused by his turbulent nobility, and no sooner were they subdued than he appeared again in Italy to meet the Guelf nobles. In spite of his efforts, even his natural son Conrad turned against him, and soon after his coronation as King of the Romans the heir to the Empire

himself was induced by Pope Paschal II. to depose and imprison his father. The last days of the great Emperor were passed at Liège, whither he had escaped, and where he died in 1106. HENRY V. (1106-25) continued the struggle, which was brought to a conclusion by the compromise of the Concordat of Worms (1122).

Henry, surnamed "the Lion," Duke of Saxony and Bavaria (1129-95), head of the Guelph family, was the most powerful German noble of his time. A great league was formed against him in 1166, but he was at first supported by the Emperor Frederick I. In 1180, however, he was deprived of his dominions, and put to the ban of the Empire, and was not restored until 1192 by Henry VI. He was the founder of Munich, and to his protection Hamburg and the Baltic ports owed much of their growing prosperity. He married Matilda, daughter of Henry II. of England.

Henry the Navigator, PRINCE, third son of John I. of Portugal, by Philippa, granddaughter of Edward III. of England, was born in 1394, and first distinguished himself at the capture of Ceuta in 1415. From that time he devoted himself to the extension of maritime discovery and commerce. He established a school of navigation at Sagres, and, as a first measure, sent out expeditions to round Cape Bojador, the southernmost point then known. In these efforts Madeira and Porto Santo were discovered. Bojador was first rounded by Gil Eannes and John Diaz in 1434. Two years later another expedition under Baldaya proceeded 120 miles farther to the southward, and so, little by little, Cape Blanco, the isle of Arguin, Cape Verde, and the mouth of the Gambia were added to the maps. Prince Henry, after a most useful and well-spent life, died at Sagres in 1460. He deserves to be regarded as the father of modern maritime discovery.

Henry I. (1005-60), the third of the Capel line, succeeded his father Robert in 1031. He was succeeded by his eldest son, Philip I.

Henry II. was born in 1519, and succeeded his father Francis I. in 1547. He carried on the policy of the latter by allying himself with the German Protestants against the Empire, and obtained for France the three duchies, Metz, Toul, and Verdun. In 1557, however, his troops met with reverses in Italy and at St. Quentin, the last great disaster being only partially compensated by the recovery of Calais from England. In the year of the treaty of Cateau Cambrésis (1559) Henry was mortally wounded in a tournament by the captain of the Scottish Guard, Montgomery. This king strongly resembled in character Francis I., but the influence of the Guises led him at times to adopt a Catholic policy. His wife was the celebrated Catherine de Medici (q.v.), and his favourite mistress Diane de Poitiers.

Henry III., third son of Henry II., was born in 1551, and succeeded his brother Charles IX. in 1575. Previously to this he had, in command of the royal army, defeated the Huguenots at Jarnac and Moncontour (1569), and had been active on

the day of St. Bartholomew (August 24, 1572). Next year he was elected King of Poland. His reign in France is noteworthy as the period at which the religious wars reached their height. The struggle was not, however, solely between Catholic and Huguenot, but was complicated by the ambition of the Guises and the Queen-mother, Catherine de Medici. The weak king, at first led by religious fanaticism to support the Holy League against the Huguenots, afterwards became tired of his masters, against whom Catherine also intrigued. In 1588, at a great crisis in the affairs of Europe, Henry, Duke of Guise, was assassinated at Blois, and his brother, the Duke of Lorraine, imprisoned. The result of this was that Catholic Paris turned against the king, who was obliged to ally himself with the Huguenot Henry of Navarre. The two Henrys besieged Paris, but in August, 1589, the King of France was assassinated by Jacques Clément, a Dominican. Henry III. was the last male of the house of Valois. He was vicious and incapable, a prey in turn to dissipation and superstition.

Henry IV. (HENRI QUATRE), cousin of Henry III., was the third son of Antoine de Bourbon and Jeanne d'Albret, daughter of the King of Navarre and Béarn, in which latter he was born in 1553. He is thus known in history as "Le Béarnais" and Henry of Navarre before he becomes Henri Quatre. He was educated as a strict Calvinist by his mother, and was brought to La Rochelle in his seventeenth year from the fear that he would be carried off to the Spanish court. The same year he was present at Jarnac. By the treaty of St. Germain, which closed the third Huguenot war, Henry of Navarre was to be betrothed to Marguerite de Valois, the sister of Henry III., and the marriage took place a week before St. Bartholomew's Day, 1572. To save himself from death in the massacre Henry had to profess himself a Catholic, and till 1576 he was practically a prisoner at the French court. Having escaped to Alençon, he again took command of the Huguenot army, and by his conduct aided greatly the cause of his co-religionists. In the last years of Henry III. the cousins were allied against the Guises and Spain, and on the death of the king Henry of Navarre claimed the crown as nearest male descendant of the house of Valois. He was opposed by Philip II. of Spain on behalf of his daughter, while the League put forward Cardinal Bourbon, and thus divided the Catholic interest. In 1590 Henry defeated Mayenne, Bourbon's general, at Ivry, and after three years of fighting he came to the conclusion that Paris was well worth a mass ("*Paris vaut bien une messe*"), and therefore formally recanted his Protestantism before the States-General, who at the same time declared the Spanish pretensions invalid. Paris admitted him within its gates next year, and from this time Henry was virtually king, although the war went on till the Peace of Vervins in 1598. In that year was issued the Edict of Nantes, giving freedom of worship to the Huguenots. During the reign of Henry IV. the work of organising the kingdom begun by

Louis XI. was again taken up. Great financial reforms were carried out by the Duc de Sully (q.v.), to whom Henry in great measure owed his position, and by the making of roads and canals the different provinces were brought more closely together, and France began to become one united well-administered kingdom. Henry had just married a second time, and was contemplating a fresh war with Spain, when, on May 14, 1610, he was assassinated by Ravallac, who had been instigated by the Jesuits. Henry IV. was, with the possible exception of Louis IX., the greatest of the French kings. The necessities of his position made him, like Frederick the Great, a Protestant hero, but he was in no sense attached to religious principles, and, in spite of many fine qualities, was, in his private life, as licentious as most Frenchmen of the time.

Henry of Huntingdon. [HUNTINGDON.]

Henry, JOSEPH, an American electrician and meteorologist, was born about 1799 at Albany, New York. While a watchmaker's apprentice he eagerly devoted himself to scientific studies, with such success that in 1832 he was made professor of natural philosophy at Princeton. In 1846 he became secretary of the newly-founded Smithsonian Institution, and held this post almost until his death in 1878. He made important discoveries in connection with the electro-magnet, and took much interest in meteorology, being first chairman of the National Lighthouse Board. A memorial of him was published by order of Congress in 1880.

Henry, MATTHEW (1662-1714), author of an *Exposition of the Old and New Testament*, commonly known as *Henry's Bible*, was born in Flintshire, and died at Nantwich. He had charge of Nonconformist congregations at Chester and Hackney. His commentary was finished by other ministers, and is still a standard work rather by reason of its devotional character than on account of its exegetical value.

Henry, PATRICK (1736-99), one of the most influential leaders in the American War of Independence, was born in Virginia. Having failed as a shopkeeper and a farmer, chiefly on account of his extravagance, he became a lawyer in 1760. Three years later he made his reputation as an orator in a case relating to the revenues of the clergy. An action was brought by a minister to recover his salary, which was payable in tobacco. As that commodity had lately greatly advanced in price, the Virginian Legislature had commuted payment to a sum of money in the ratio of the former value. Henry appeared for the defence and carried his point, the importance of the action lying in its political character, since the royal assent had been refused to the Commutation Act. The eloquence of Henry in this case produced a profound impression, and henceforth his professional career was assured. As a member of the House of Burgesses he, in 1765, moved and carried resolutions against the Stamp Act, and in 1774 he was a delegate to the Virginia Convention, where next year he delivered his second great speech on the motion that the colony be put in a state of

defence. He was a member of the Continental Congress of 1775, and next year was elected first republican Governor of Virginia, being re-elected in 1777, 1778, and 1784. In 1788 he opposed the ratification of the Federal Constitution as being prejudicial to the liberties of the separate states. In 1794 he retired into private life, and next year declined the Secretaryship of State offered him by Washington. There are several lives of Patrick Henry, the most recent being by his grandson, William Wirt.

Henry's Law, relating to the solution of gases in liquids, was enunciated in 1803, and states that "under equal circumstances of temperature water takes up in all cases the same volume of condensed gas as of gas under ordinary pressure." Hence, owing to the relation between the volume and pressure of gases [BOYLE'S LAW], it follows that the quantity of gas absorbed by water varies directly as the pressure of the gas. The law was extended by Dalton, who showed that in the case of a mixture of gases, the quantity of each gas absorbed depends only on the pressure exerted by that gas, and not on the total pressure due to the mixture.

Henslow, JOHN STEVENS (1796-1861), was born at Rochester and educated there and at Cambridge, where he graduated B.A. in 1818 and M.A. in 1821. He became professor of mineralogy in 1822, and of botany in 1825, and did much to render science popular in the university. His most distinguished pupil was Charles Darwin, whom he recommended to accompany the *Beagle*, but from whose distinctive tenets he differed to the last. In 1832 he became vicar of Cholsey, Berkshire, and in 1837 of Hitcham, Suffolk, where he died. Here he distinguished himself by introducing popular science-teaching into his village-schools and by other philanthropic efforts. He also took a leading part in establishing the Ipswich Museum and that of Economic Botany at Kew.

Hepatica, a sub-genus of *Anemone* (q.v.) distinguished by having the involucre of three undivided leaves close to the flower and by having no tail-like persistent styles to the carpels. *H. triloba*, a European species, with blue, pink or white flowers, is common in our gardens, and the fancied resemblance of its trilobed leaves to the liver gave the group its name.

Hepaticæ. [LIVERWORTS.]

Hephæstus was a god of the Greek mythology, almost corresponding to the Roman Vulcan. He was the god of fire, and the patron of those who worked in iron and other metals. The son of Zeus by Hera, he was thrown from heaven by his mother on account of his deformities. He was restored, and a second time thrown out by Zeus, and upon this occasion he fell into the isle of Lemnos, breaking his leg in his fall. Here he built a palace and established forges, and he had also forges under Ætna, where, with the aid of the Cyclopes, he forged the thunderbolts of Zeus and the arms of the gods. He it was who created Pandora. His wife was Aphrodite, and her amours caused

Hephæstus much annoyance, and on one occasion he caught her and her lover and exposed them to the view of the assembled gods. His portraits generally represent him as lame, and with some accompaniment having reference to his connection with metal-working.

Heptanes are paraffin hydrocarbons (q.v.) possessing the formula C_7H_{16} . Theoretically, 9 different heptanes are possible, and of these 4 are known. Ordinary or *normal* heptane boils at 99° , and is found in petroleum. By the replacement of one hydrogen by the group OH, *heptyl* alcohols result, and 23 different varieties are known. By oxidation these yield a number of *heptoic* (or *œnanthyllic*) acids, having the composition $C_6H_{13}COOH$, which are all fatty-smelling oily liquids.

Heptarchy is applied as a collective term to the seven kingdoms supposed to have existed in England in Anglo-Saxon times before the final supremacy of Wessex. In reality there were many more than seven kings and kinglets, but Wessex, Sussex, Kent, East Anglia, Mercia, and Northumbria became at one time or another more powerful than any of the others.

Heptoses are carbohydrates (q.v.) possessing the formula $C_7H_{14}O_7$, and in many respects resemble the ordinary *glucoses*, which possess 6 carbon atoms. From these, however, they differ in one important respect, being not fermentable by yeast. [GLUCOSES.]

Hera, in Greek mythology, the queen of the gods, sister and wife of Zeus, and daughter of Kronos and Rhea. She was said to have been born at Argos or Samos, and in the latter island her marriage was thought to have taken place, whence the epithet sometimes applied to her of Samian. In each of these spots she had temples, and was a special object of worship. She is represented as obdurate and jealous, and often visited with her wrath the various objects of her husband's wayward amours, for instance, Latona, Semele, Alcmena, and Io. She hated and persecuted Hercules, and aided the Greeks in the Trojan War. She is often represented with a crescent, and her most usual accompaniments are Iris, the peacock, the goose, and the cuckoo, or one or more of them. Her festival, the Heræa, was held at Argos every five years.

Heraclea. 1. An ancient town of Magna Græcia near the Gulf of Tarentum, between the rivers Siris and Aciris, was a colony from Thurii and Tarentum, and, till the time of Alexander of Epirus, the central meeting-place of the Italian-Greek colonies. Here Pyrrhus beat the Romans in 280 B.C., and the city was still prosperous in the days of Cicero. In 1753 fragments of inscriptions were discovered here, one relating to a temple, and the other containing the Lex Julia Municipalis of 45 B.C. These are now in the National Museum at Naples.

2. HERACLEA MINOA, in Sicily, near which Regulus defeated the Carthaginian fleet, 256 B.C.

3. HERACLEA PONTICA, in Phrygia, where there are coal-pits which supply Constantinople.

4. The name of one of the islands called Sporades.

Heraclitus, a Greek philosopher who flourished towards the end of the 5th century B.C., was born at Ephesus, where he might have attained to high political position had he not preferred to devote himself to philosophy. For some time he travelled, especially in Africa, and on his return to his native city he still refused all dignities, and shortly after adopted a hermit life, dying at the age of 60. The fragments of his writings that remain show him to have belonged to the Ionic school, though there were some points of difference. According to him, fire is the original element of all things, and all existence is in the way of evolution from it. The fire possesses a rational principle, and is the source of soul. It is in a continual motion upwards and downwards from heaven to earth and earth to heaven, and man's soul is part of the fire from heaven which is always tending upwards. The only repose is where there is equilibrium between the ascending and descending forces. Heraclitus greatly influenced Plato and the Stoics, and disciples of Hegel have found striking anticipations of his modes of thought in those of the Greek philosopher.

Heraclius (reigned 610-641), one of the Roman Emperors of the East, was born about the year 575, being the son of Heraclius, Exarch of Africa. The father gained some notable conquests over the Persians, and when Phocas, who had killed Mauritius and usurped the throne, was attacked by insurgents, the throne was offered by these to the elder Heraclius. After some coquetting he declined it, but sent his son from Carthage with a fleet to aid the rebels. On the arrival of Heraclius the younger at Constantinople, the insurgents killed Phocas and put Heraclius on the throne. He was a good ruler, but could not make effectual head against the advance of Mahomet, and his son Constantine III. succeeded to the throne of a fast-decaying empire.

Herald (Old High German *herolt*, for *hari-wald*, "army-strength"), originally an officer employed to convey proclamations of peace and war, and other messages from the court of one sovereign or feudal lord to that of another. When the science of heraldry (q.v.) grew up in the western countries of Europe, it became the business of heralds to see that the regulations concerning the bearing of coat-armour were properly observed, and this range of duties further required a knowledge of genealogies and the descent of titles. Commonly each order of knighthood had its own herald with an attendant body of "pursuivants" whom he was supposed to train in the duties of the office. The "York," "Windsor," and other heralds are frequently mentioned in English documents of the 14th and 15th centuries. The chief herald was known as the "King of Arms;" in England in the 14th century there were two such "kings." "Norroy" and "Surroy" (afterwards "Clarencieux"), exercising authority north and south of the Trent respectively. Under Henry V. a new king of arms, the "Garter," took precedence of the other two. The "Lyon" and "Ulster" kings of arms exercised similar functions in Scotland and Ireland. The

Heralds' College, or College of Arms, was instituted, under the direction of the Earl Marshal, in 1483, and in 1554 the members were located in the building in London which they now occupy.

Herald Moth (*Gonoptera libatrix*, Linn.), a species which lives on willows and spins cocoons, which it protects by binding together the leaves at the end of twigs. The moth lives for more than one summer, and it passes the winter hibernating in outhouses, etc.

Heraldry, which has been truly called "the shorthand of history," as a word at the present time carries a meaning rather different from that which it has conveyed at other periods—changing perhaps as the duties of a herald have been modified. As ordinarily used, it is intended to signify what is more definitely expressed by the word "armory," and it includes all matters relating to arms and crests or appertaining to an armorial achievement. But the regulation of armorial bearings is but a portion of the duties falling to the lot of the herald, for the science of heraldry really also concerns the marshalling of processions and conducting of the ceremonies of coronations, the installations, creation of peers, funerals and marriages, the declaration of war, and the proclamation of peace—and, during the Middle Ages, the bearing of letters and messages of courtesy and defiance between royal and knightly personages. Further, a herald was held responsible for the superintendence of trials by battle, tournaments, jousts, and such like encounters; and in the still earlier ages for the numbering of the dead after the conflict and the recording of the valiant deeds which had been performed were part of his work.

It is difficult—well-nigh impossible—to place a definite line between ornament pure and simple and heraldry; for the latter is simply the codification, as it were, of certain acknowledged forms of ornament and certain opportunities for the display of ornament and the combination and the usage of a combination of the two under certain known and acknowledged laws, originally self-apparent or legally imposed.

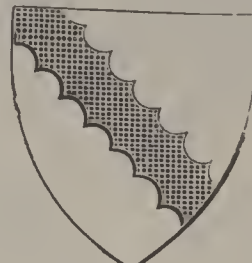
The Japanese at the present day have their badges—well-known, simple, and hereditary—which have existed for centuries and which are now and have been always displayed in a manner very similar to the usage of such ornaments in the Tudor days. In Hindustan it is easy to assimilate the hereditary symbols with Western ideas and heraldic laws. Even among the North American Indians tribal "totems" have an acknowledged existence and an appreciable value.

All such marks are borne for the purposes of *distinction* in one or the other meaning of the word, more frequently in *both* of its meanings. That such symbols should from the far remote ages have been placed upon the shield which was carried in battle is easy enough to understand; for a man's weapons and his armour were his most cherished possessions; he loved them, he decorated and took care of them. He placed strengthening bars of wood or metal across them in various positions and he painted these of a different colour, or polished

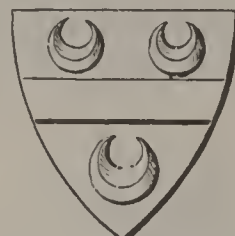
them into prominence. And from this simple reason have been evolved the fesse, the pale, the chief, the bend, the chevron, and those other familiar figures which are known as the *ordinaries* and *subordinaries*. Over all, or conveniently placed and disposed in relation to his strengthening bars, he painted his favourite "devise" or "connoissance," and such is the origin of the coat-of-arms—the



PALE.



BEND ENGRAILED.



FESSE.

"écusson" or escutcheon of later days. For such devices being very early used to decorate the shields, a practice known to the Greeks of old, and possibly pointing back even to totemism (q.v.), the term "arms" was soon applied to them, and the expression he "bears" such and such arms soon came into use. In the thirteenth century it became usual to embroider the "arms" upon the surcoat which was worn over the coat-of-mail, and the former consequently became a "coat-of-arms," hence the latter term.

The date of the resolution of heraldry into a science has yet to be discovered. Emblems or figures—call them what you will save arms—undoubtedly appeared upon the shields of the Normans as figured in the famous tapestry of Bayeux, but it requires a stretch of diction and imagination to admit these as arms: and no mention which can be so construed is to be found of the heraldic decoration of shields in any of the minute and detailed accounts of the First Crusade. Their existence at the time of the second can hardly be taken as an indisputable fact; but before the third, armorial bearings were in accepted and very general usage throughout Europe.

Very soon after their introduction arms became hereditary, and the reason is not far to seek. The son inherited his father's lands and responsibilities, he espoused his father's quarrels and was proud to use the weapons his father had fought with. Thus it was general for the son to carry a similar shield.

And one of the earliest—perhaps *the* earliest—of heraldic laws is one which points to a keener appreciation of art and colour on the part of our early progenitors than we may be inclined to give them credit for. Drawing-masters of to-day point out the necessity of contrast to show up the various colours, *e.g.* that a red band across a blue background is not so brilliant as across a white one, and that by placing white spaces between the blue and the red the brilliance of both is heightened. And this same idea will account for the said law in heraldry that neither colour may lie upon colour nor metal upon metal. For heraldry knows but two metals "or" and "argent" (gold or yellow and silver or white), whilst the colours ordinarily in use are "gules," "azure," "vert," "sable," and "purpure" (*viz.* red, blue, green, black and purple). Furs, which are always mixtures of metal and

colour, may be surmounted by either but not by another fur.

One of the greatest mistakes in the popular conception of heraldry, and one that has argued very fatally against that science, is to suppose that every charge upon a shield must have some legend connected with it, or that it is placed there to exhibit some positive meaning.

Undoubtedly some *explanation* is frequently forthcoming for the charges upon ancient and for a large number of the modern coats-of-arms; for a



COCKATRICE



WYVERN.



DIMIDIATION.

very large proportion of all coats-of-arms turn out upon investigation to be "canting" arms, as they are termed, which may be readily explained as containing some pun (frequently very far-fetched) or anagram relating to the names or estates of the first owner of the escutcheon. For instance, the water-bougets borne by Lord De Ros at the present day originated with the Trusbut family, whose heiress married a De Ros. The Trusbuts, Barons of Wartre in Holderness, bore arms in which the water-bougets were anciently blazoned ("to blazon" is to heraldically describe a coat-of-arms in words, and a "blazon" is such a description) "trois boutz d'eau," thereby punning both their own name and the name of their estates.

Still further, many Crusaders on their return from the Holy Land placed bezants, escallop-shells, crosses, palmer's staves, and Saracen's heads upon their shields; but it would be folly on that account to attempt to state that every person upon whose escutcheon a bezant or an escallop shell is placed had an ancestor in the Holy Wars. The Crusades originated undoubtedly an enormous proportion of the commonly accepted heraldic "charges"; but once originated they became common property so long as their arrangements upon the escutcheon when designing a new coat did not interfere with anyone else's arms.

Many fabulous animals exist in heraldry which have no place in natural history, *e.g.* the dragon, the wyvern, the cockatrice, the griffin, and the pegasus, but they can hardly be said to have originated in heraldry, though in one or two cases the ancient heraldic artists must certainly be held responsible for giving a definite form and semblance to unknown though accredited monsters; and the double-headed eagle undoubtedly and perhaps also the griffin, may trace an origin

in the ancient manner of "impaling" two coats of arms by "dimidiation," *i.e.* by taking half of each coat and placing them together. The present revival of the mediæval style of draughtsmanship in treating heraldry has much helped to preserve the antique forms of some of these chimerical conceptions.

Heraldry at the present day has been brought much into disrepute owing to the wholesale corruption of the art by advertising heraldic purveyors, and by the ignorant or wilful assumption of armorial bearings by those utterly unentitled to such distinction and by those who openly flout the authority of the officers of the Crown appointed to regulate such matters: for, "surely, even those who affect the greatest contempt for heraldry, will admit that, if arms are to be borne at all, it should be according to the Laws of Arms; and that if the display of them be but an empty vanity, it is a less creditable vanity to parade as our own those which belong of right to others." [ARMORIAL BEARINGS.]

Heralds' College, or, to use its more correct and grandiloquent description—viz. "Her Majesty's College of Arms"—stands back surrounding its diminished courtyard area from the northern side of Queen Victoria Street, close under the shadow of St. Paul's, and belongs to the corporation of its members, who are officers of arms. These officers of arms, though holding office under the Great Seal of England and direct from the Crown, are all nominated by His Grace the Duke of Norfolk, K.G., as Hereditary Earl Marshal of England, who exercises control over the College, and upon many matters has absolute discretion and authority. At different times different and very various titles have been borne by the officers of arms, but they first acted in a collegiate capacity in the reign of King Henry V., and were incorporated by a Royal Charter in the reign of King Richard III., a further charter being granted by King Edward VI. This last provided for the existence of three Kings of arms, six Heralds, and four Pursuivants, in which style the corporation has since continued, and at the present time the officers are Garter Principal King of Arms, Clarenceux King of Arms, and Norroy King of Arms; Chester, Windsor, Lancaster, York, Somerset, and Richmond heralds; with Portcullis, Rouge Dragon, Rouge Croix, and Bluemantle Pursuivants. Various extraordinary officers have from time to time been created, and at the present time two are in existence—viz. Surrey Herald Extraordinary and Maltravers Herald Extraordinary. The jurisdiction of the English College and of the Earl Marshal extends throughout the whole of Her Majesty's dominions with the exception of Scotland and Ireland—the former of which is governed in matters armorial by Lyon Office and the latter by Ulster Office. The *Records* of the College (as distinct from the *Collections*) never leave the custody of the officers of arms, and are accepted in Her Majesty's Courts of Law as incontrovertible evidence, and have been likewise in other countries. These records consist of the series of books called *Visitation Books*, containing the pedigrees and arms of the nobility and gentry taken under Royal

Commissions from 21 Henry VIII. to the latter part of the seventeenth century, the last commission being issued 2 James II. Since the visitations such pedigrees have only been recorded upon voluntary application, and the books of these are termed the *Modern Records*. There are also books of the pedigrees and arms of peers compiled pursuant to the standing orders of the House of Lords of May 11, 1767, and books containing the arms and pedigrees of baronets in accordance with a Royal Warrant of 3rd December, 1783, "for correcting and preventing abuses in the Order of Baronets." In addition there are certain funeral certificates, books containing accounts of certain royal ceremonies, the books of the grants of arms, and what are known as the Earl Marshal's books, which, commencing in the time of Queen Elizabeth, contain entries of warrants under the Royal Sign Manual upon various matters. In addition to these records, the College contains the "collections" of former heralds and genealogical writers—either willed to them or acquired by purchase—which, though great in value, have not been compiled or accumulated under any royal or other warrant. The salaries of the officers are merely nominal, their remuneration being derived from fees, which by no means approach the amounts frequently supposed. A herald or a pursuivant is always "in waiting" in the Public Office to transact the business of anyone who is a perfect stranger, but the various officers have all private sets of apartments in the College, and the "practice" and "clientèle" of each officer is arranged and conducted in a manner very similar to that in vogue in the legal and medical professions.

Herat, a city of North-West Afghanistan, situate in a plain on the river Heri-Rud, 370 miles west of Cabul. It is defended by a citadel, mound, wall of sun-baked brick, and a ditch fed by water from neighbouring springs and from the river. There are several gates with streets of bazaars leading from them to a central square. Among the public buildings are mosques, caravanserais, and baths. The chief industries are the manufacture of carpets and sword blades, both considerable, and of shoes, cloaks, and lambskin caps. The trade is great, since the town is on the high road between India and Persia; moreover, it is of considerable importance in times of war. The chief objects of trade, which is carried on mostly by Hindus, are assafoetida, caraway seeds, dye, gum, manna, mastic, pistachio nuts, and saffron. There is also a through trade in shawls, indigo, sugar, chintz, leather, muslin, and skins. Herat was once the capital of Tamerlane's empire, and the ruins in the neighbourhood are numerous.

Herault, a department of France, having Gard to the north and east, the Gulf of Lyons on the south and south-east, Aude to the south-west, Tarn to the west, and Aveyron to the north-west, and containing 2,393 square miles. The Cevennes occupy the north-west, and from them the surface slopes rapidly to the south-east, terminating in low-lying coast with extensive

lagoons. The department contains four arrondissements, divided into 335 communes. It is drained by the rivers Herault, Orb, and Lez, which are navigable for a part of their course, and is traversed by the Canal du Midi, which terminates in the lagoons. About one-sixth of the department is arable, and produces a considerable quantity of grain, and there are extensive vineyards and abundant fruit, especially mulberry and olive. Dye-plants are also largely cultivated, and fine oak timber abounds. Among the minerals are coal, copper, gypsum, marble, millstone, and slate.

Herbal, a book dealing with plants especially from the point of view of their medicinal properties. Such books were formerly numerous, but have ceased to be of much medical value. Among the more important herbals are the *Hortus Sanitatis* (1486), *The Grete Herbal* (1516), *A Little Herbal*, by Anthonye Ascham (1550), those of Brunfelsius, Cordus, Ruellius, Fuchsius, Gesner (q.v.), William Turner (q.v.) (1551-66), Dodoens (1553), translated into French by Clusius (1557) and into English by Henry Lyte (1578), John Gerard (q.v.) (1597), emended by Thomas Johnson (1633), Nicholas Culpepper, largely astrological and since often reprinted (1652), *The English Herbal*, by William Salmon (1711), and *A Curious Herbal*, by Mrs. Elizabeth Blackwell (1739).

Herbarium, a collection of dried plants for scientific study. The finest in the world is that at Kew, based upon those of Sir W. J. Hooker (q.v.) and George Bentham, and comprising some 100,000 species of plants. That of the British Museum contains the various collections got together by Sir Hans Sloane (q.v.) and that of Sir Joseph Banks. The herbaria of Dillenius, Sherard, and Fielding are preserved at Oxford, and that of Linnæus (q.v.) by the Linnean Society of London. Other important herbaria are those of the De Candolles at Geneva, the Jussieus and St. Hilaire at the Paris Jardin des Plantes, Grisebach at Göttingen, Asa Gray at Harvard, and Baron Müller at Melbourne. Herbarium specimens being liable to the attacks of various insects, camphor is placed near them, and they are sometimes brushed over with a poisonous mixture of corrosive sublimate and carbolic acid dissolved in spirit.

Herbart, JOHANN FRIEDRICH (1776-1841), a German philosopher whose views are formed partly on the system of Kant and partly on that of Fichte, although his great work was to oppose the doctrine of the idealists as inaugurated by Kant and carried on by Fichte, Schelling, and Hegel. His position in philosophy is chiefly that of a critic of other systems, and the first part of his labours was an analysis of the doctrines of Spinoza, Leibnitz, and Kant, and a comparison of them with those of Fichte, Fries, and Schelling. One of his special peculiarities is an endeavour to apply mathematical and mathematico-physical principles to psychology. He produced many works. Among them are an *Introduction to Philosophy*, *Manual of Psychology*,

and works on logic and metaphysics. He is of some importance also in the science of education.

Herbert, ARTHUR, EARL OF TORRINGTON. [TORRINGTON.]

Herbert, EDWARD, commonly known as LORD HERBERT OF CHERBURY (1581-1633), an English author, was born at Montgomery Castle, and at an early age was entered as a gentleman commoner of University College, Oxford. In 1600 he was in London, and was knighted after marrying the heiress of another branch of his own family. He then went abroad till 1607, living a romantic and adventurous life. In 1609 he went abroad to take service with the Prince of Orange, and was again in the Low Countries with him in 1614. In 1618 he went to France as ambassador, but some arrogance of conduct led to his recall, though he returned to Paris after the death of the Constable Luynes. In 1624 he produced in Paris his chief work on *Natural Religion*, in which he argued that revelation was not needed. In 1625 he was made an Irish peer, and in 1631 an English baron. In the early part of the struggle between king and people he was inclined to the Parliamentary side, but afterwards adopted the Royalist cause, and suffered considerably for his loyalty. He wrote also *Poems* (published 1665), *Memoirs* (published 1764), and a *Life and Reign of Henry VIII.*, and a work *De Religione Gentilium*, which was published after his death.

Herbert, GEORGE (1593-1633), younger brother of the above, was born at Montgomery Castle. He was educated at Westminster and at Trinity College, Cambridge, becoming fellow of the latter society in 1615, and being from 1619 to 1627 public orator of the university. In 1625 he was ordained, and was appointed to a prebend at Lincoln. In 1630 he was ordained priest, and appointed to the living of Bemerton, Wiltshire, where he led a life of piety and humility. He is chiefly known by his poem *The Temple*, and a prose work *The Country Parson*, and through his life, written by Izaak Walton. Parts of his *Temple* have almost passed into proverbs. *e.g.* "Touch not the third glass," "Constancy doth knit the bones, and make them stout."

Herbert, SIDNEY, afterwards Lord Herbert of Lea (1810-1861), an English statesman, was the second son of the eleventh Earl of Pembroke, and was born at Richmond in Surrey, his mother being a Russian lady. He was educated at Harrow, and at Oriel College, Oxford, and in 1832 entered Parliament as member for North Wilts in the Conservative interest. In 1841 he became Secretary to the Admiralty and in 1845 he was Secretary for War under Peel, and in the Cabinet. He became an advocate of free trade, and retired with Peel in 1846. He was a member of the Aberdeen Cabinet in 1852, and was Secretary for War till 1855, when he retired with his leader over the question of the Crimean War. In 1859 he was Secretary for War in Lord Palmerston's Government. In 1861 he went to the House of Lords, but his health was

broken down. He lived at Wilton near Salisbury, and the striking church which he built there is well known.

Herbivora, an old order of Mammalia equivalent to the Ungulata (q.v.).

Herculaneum, an ancient town of Italy, five miles S.E. of Naples, was buried by an eruption of Vesuvius A.D. 79. The city, said to have been founded by Hercules, was very ancient, and fought at a later period in the Social War against Rome. Later it was a fortified town and a valuable fort. It is said to have been a second time overwhelmed A.D. 472. The city was much more completely covered than Pompeii, and it was not till 1713 that an important discovery was made of three statues during the digging of a well in the village which had arisen upon the ancient site. This was followed up in 1750 by the discovery of a passage leading to the theatre, but excavation of this has been rendered difficult by the position of the village above. In a square south of the theatre, which seems to date not much farther back than the eruption, is a temple, and there is another on the east connected by a street with porticoes. One of these temples was restored by Vespasian. To the north of the theatre is a basilica 228 feet long by 132 feet wide surrounded by 42 columns. Many paintings were found here. The discoveries at Herculaneum have been of a most interesting description, and throw a great deal of valuable light upon the arts, mode of life, etc., of the period of their entombment. Very many statues have been found, a private villa, and many more houses, and remains of food even had not perished. The scarcity of human remains seems to show that most of the people had time to escape. Among the most precious of the finds are a quantity of papyri, but some of these are useless through the effects of heat and other agencies, though many have been unrolled and the contents published. Unfortunately they are not of first-rate interest, bearing chiefly on the details of the Epicurean philosophy. The Naples Museum is rich in remains of Herculaneum, which city seems to have been better provided with art-treasures than its sister Pompeii.

Hercules, called in Greek HERACLES, or ALCIDES, is a half-mythical demigod of Greek mythology, chiefly to be regarded as embodying the perfection of physical manhood, and as illustrating the perpetual struggle of *la bête humaine* against the higher impulses of man's nature. Hercules was the son of Zeus by Alcmena the wife of Amphitryon, whose son he was generally supposed to be. When he was a few months old Hera, in her jealousy, sent two snakes to kill him, but the child strangled them. He was afterwards carried to heaven and surreptitiously placed at Hera's breast, thus imbibing a further portion of divine nature. Returning to earth he grew up at Thebes, being taught by Castor to fight, by Eurytus to shoot, by Autolycus to drive, and by Eumolpus to sing, the finishing touches to his education being given by Cheiron the Centaur. A legend relates that at the outset of life he had the choice of following

pleasure or virtue, and that he chose the latter. At eighteen he killed a lion on Mount Cithæron, and Thespius's fifty daughters became pregnant by him. After the slaughter of the lion Kreon of Thebes gave Hercules his daughter in marriage, and handed over to him the government of the country. But Hera drove him mad, and caused him to kill his children during a delirium in which he imagined them to belong to Eurystheus, who had summoned him to Mycenæ. He retired from public life and consulted the oracle, which ordered him to subject himself to Eurystheus for 12 years, during which he performed the well-known twelve labours, being armed for their accomplishment by the gods. The labours were (1) the slaughter of the Nemean lion, (2) killing, with the aid of Iolas, the Lernaean hydra, (3) capturing the stag with the golden horns and brazen hoofs (which involved him in a quarrel with Artemis), (4) slaying the Erymanthian boar, (5) the cleansing of Augeas's stables, (6) the slaughter of the Stymphalian birds, (7) capturing the Cretan bull, (8) capturing the mares of Diomedes, (9) taking the girdle of the Queen of the Amazons, (10) killing the monster, Geryon, King of Gades, and carrying off his flocks (in the course of which he set up *The Pillars*), (11) the taking the apples of the Hesperides, (12) carrying Cerberus from Hell to the upper world. Many minor feats Hercules also accomplished, and one of his adventures, illustrated by sculptors, was his period of slavery to Omphale, Queen of Lydia. His marriage to Deianeira led eventually to his death; for when Nessus the Centaur offered violence to the wife Hercules killed him, and the dying Centaur told Deianeira that his blood would bring back her husband's love if it should ever wander from her. Finding him later enamoured of Iole, a former love, Deianeira gave him a tunic steeped in the poisoned blood, and Hercules, finding himself dying in torture, hastened events by causing himself to be burnt on a funeral pile. He was taken to heaven, reconciled to Hera, and married to her daughter Hebe. The cult of Hercules was widespread, and there are numerous statues of him, generally with a club and clad in the lion's skin. His career has sometimes been explained as a solar myth.

Hercules, PILLARS OF, were said to have been set up by that hero in the course of the travels that accompanied his tenth labour. They are said to have been at Calpe and Abyla, on the opposite sides of the Straits of Gibraltar, these being the limits of his western wanderings. Different stories are told of their origin, one being that he formed them by tearing asunder the rocks, another that he erected them to support a bridge for the passage of Geryon's flocks, another that he placed them to narrow the straits and keep sea-monsters out of the Mediterranean. Other pillars claim the name.

Hercules Metal, an alloy of copper, nickel, and aluminium, which, owing to its being untarnishable in air, and possessing a good colour, great tenacity, and hardness is well adapted for ornamental and scientific purposes.

Hercules Powder, an explosive largely employed in the United States, consisting essentially of nitro-glycerine (q.v.), but containing also sodium nitrate, magnesium carbonate, and wood pulp in varying quantities. The power of the explosive is about the same as that of good Kieselguhr dynamite.

Herder, JOHANN GOTTFRIED VON (1744-1803), a German author, was born at Mohrungen in East Prussia. In his youth a Russian surgeon offered to teach him surgery, and in 1762 he went to Königsberg, but fainted at the first sight of dissection. He abandoned surgery in favour of theology, and also attended Kant's lectures. He distinguished himself in general knowledge, and in 1764 was made master in the cathedral school at Riga and preacher. He gave up this post and, declining the offer of a post at St. Petersburg, began to travel. In France he acted as travelling-tutor to a German prince on tour. Disease of the eyes stopped him at Strasburg, and he there made the acquaintance of Goethe, and in 1775 Goethe's influence got him the post of court preacher at Weimar. Here he showed himself a good pulpit orator and an energetic inspector of schools. In 1801 he became President of the High Consistory, and was ennobled by the Elector of Bavaria. Before 30 he had published a work on modern German literature, and a book called *Critical Words*. His chief work was *Ideas on the Philosophy of the History of Humanity*. He also published some poems, among them *The Cid*. His works were published in 40 volumes at Stuttgart (1852-54).

Heredity, the conservative principle in inheritance, or the tendency of organisms to resemble their parents, is practically at present one of the ultimate or unexplained facts of biology. Hypothetical explanations have been suggested by Darwin (q.v.) in his theory of Pangenesis (q.v.), and by Professor Weismann in that of the "permanence of the germ-plasm." Some unexplained generalisations of the facts of heredity can be stated as "laws." Among these are the law of ontogenetic recapitulation of phylogeny, formulated by Von Baer (q.v.), that each individual in its development passes through a series of forms representing its ancestors of a less and less remoteness; that of precocity or anticipatory inheritance, pointed out by Darwin, by which characters tend to be inherited at slightly earlier stages of development; and that of atavism or reversion, by which characters sometimes skip one or more generations, offspring resembling grandparents more than parents. Another remarkable class of cases is the inheritance of certain characters exclusively by one sex among the offspring. The inheritance of acquired characters is denied by Weismann, but this question is still under discussion. The strength of this principle, even in the field of moral character, has of late been made the foundation of a literature which dangerously undermines the doctrine of moral responsibility.

Hereford, city and parliamentary borough (returning one member), and capital of Herefordshire,

on the left bank of the Wye, 120 miles W.N.W. of London. The city is situated near the centre of the county, upon rising ground, in a fertile valley. The principal streets are broad and straight, and, while the chief buildings are of stone, the houses are, for the most part, of brick. The cathedral, rebuilt by William I. and restored by Sir G. Scott in 1863, is near the river, and has a length of 335 ft. by 174 ft. wide. Other public buildings are the college, the shire hall, an eighteenth-century county gaol, a free library and museum, and a market hall. There are many charities. The chief industries are the manufacture of gloves, leather, turnery, nails, and the brewing of ale and porter. There is a trade in hops, wool, cider, timber, oak-bark, and agricultural produce. A music festival is held here triennially in September.

Herefordshire, an inland county of England, having Shropshire on the N., Monmouth and Gloucester on the S., Worcester on the E., and Radnor and Brecknock on the W. It is 38 miles long from S.E. to N.W., and has an extreme breadth of 32 miles, and contains nearly 5,333,000 acres, of which 500,000 are arable, meadow or pasture. The soil is generally good, though in some places the pasture is poor. Much wheat is produced, and other crops are barley, oats, beans, peas, hops, and turnips. The surface slopes S. towards the Severn, into which flows the Wye with its tributaries the Lugg, Arrow, Frome, and others. The apple is cultivated generally throughout the county, and the cider is abundant and good. Horses are largely reared for riding, coaching, and agricultural work, and the cattle make good beef, though yielding scanty milk. The sheep are generally Cotswold and a cross with the Leicestershire breed. Farms are generally large, and oak is abundant and much exported. There are medicinal springs from the Malvern Hills, and petrifying springs in parts. The county returns a member of Parliament for each of its two divisions.

Herero (OVA-HERERO), a large south-west African people, who are the "Cattle Damaras" of English writers, and who occupy all the low steppe region of Damaraland between Ovampoland and Walvisch Bay north and south. The Hereros are a branch of the Bantu race, speaking a Bantu dialect closely related to that of their Ovampo neighbours and kinsmen. The chief divisions are the Zerawa, Kambazembi, Kavingava, Kamureti, Kandyii, Kukuri, and Ovambanderu. The Hereros are essentially a pastoral people, who own numerous herds of a fine breed of cattle largely exported to Cape Colony and to the European settlements on the west coast as far north as the Gaboon. For generations they have been at constant feud both with the northern Ovampos and the southern Namaquas (Hottentots). But this inter-tribal warfare has almost entirely ceased since 1886, when Kamaherero, lord paramount of the Hereros, accepted the German protectorate for himself and all his people. The true national name is *Herero*, meaning the "Merry" or "Light-hearted," whereas *Damara* (properly *Damaqua*), meaning the

"Vanquished," is a Hottentot word applied to them in contempt by the Nama Hottentots (Namaqua) of Great Namaqualand. Hence the Germans have rightly replaced *Damaraland* by the term *Hereroland* as the proper designation of their territory. The confusion is also thus avoided between the "Cattle Damaras" and the "Hill Damaras" of the eastern uplands, who are not Bantus at all, but half-caste Hottentots speaking a corrupt Hottentot dialect, and calling themselves Hou-Khoin, that is, "True Men," meaning "True Hottentots." (Francis Galton, *Travels*, 1853; Schinz, *Deutsch Süd-West Afrika*, 1891.)

Heresy (Greek, "choice"), the adoption by persons professing Christianity of opinions at variance with the general teaching of the Church. Heretics had already appeared in the Apostolic age—viz. Judaisers, who strove to maintain the old dispensation, Nicolaitans (Rev. ii.), Hymenæus and Philetus (2 Tim. ii. 17). Simon Magus, and Cerinthus (q.v.). The principal heresiarchs and heretical sects are treated separately; a summary of the chief points concerning which unorthodox views arise, with the names of leaders or sects who supported them, will therefore be sufficient here. (1) The Creation and the origin of evil—Gnostics, Manichæans. (2) The Trinity—Montanists; Monarchians, Ebionites, Carpocrates. Arians; Macedonians; Photinians. (3) The Person of Christ—Arius; Valentinus, Tatian, Docetæ, Monophysites, Monothelites; Cerinthus, Basilides, Nestorius, Eutyches. The laws *De Hæreticis* in the Justinian Code, a collection of all preceding enactments, by which heresy was made a civil crime, involving in some cases the penalty of death, were subsequently adopted in the various kingdoms of Europe. Persons suspected of heresy were tried by the archbishop and his council in a provincial synod, and, if found guilty, were handed over to the civil arm. The English statute *De Hæretico Comburendo* (2 Henry IV. c. 15) empowered the diocesan to hand over a convicted heretic to the civil arm without receiving a royal writ confirming the sentence to death. It was repealed in the reign of Charles II.

Hereward, commonly called "the Wake," a Saxon hero around whose history much doubtful legend has gathered. According to legend he was the son of Leofric of Bourn, but this seems historically doubtful. But, in any case, it seems certain that he held the "Camp of Refuge" in the Isle of Ely as the last Saxon stronghold against the growing power of William the Norman, and that eventually he had to give in to the Conqueror. Kingsley's novel, *Hereward*, develops his legendary character.

Hergest, RED BOOK OF, a MS. collection of ancient Welsh tales now in the library of Jesus College, Oxford. It is included in Lady Charlotte Guest's *Mabinogion*.

Heriot, GEORGE (c. 1563-1624), a Scottish goldsmith of East Lothian family, jeweller to James VI. of Scotland, whom he accompanied to England. His father was an Edinburgh goldsmith,

and in 1588 the son was admitted member of the Goldsmiths' Guild. In 1597 he became goldsmith to the queen. His second wife was the daughter of James Primrose, clerk of the Scottish Council, and father of the first Lord Rosebery. He died in London and was buried at St. Martin's-in-the-Fields, leaving nearly the whole of his fortune to a charity in Edinburgh, now known as Heriot's Hospital. It was first instituted in 1628. A new scheme was put forth in 1885 redistributing the revenues, which amount to about £3,200 a year. Most of us are acquainted with "jingling Geordie" through Scott's graphic sketch of him in the *Fortunes of Nigel*.

Herkomer, HUBERT, an English painter, etc., of Bavarian extraction, was born in Bavaria in 1849. He came finally to London in 1870, and has from that time steadily exhibited both in oil and water-colour. One of his best known pictures is *The Last Muster* (1875). He later became celebrated chiefly as a portrait-painter. His school of art at Bushey has gained great renown for its training capacity. Mr. Herkomer is also an engraver, architect, etc.

Hermidad ("brotherhood"), a Spanish institution, which sprang out of an association formed towards the close of the 13th century by the cities of Castile and Aragon for purposes of mutual defence against the aggressions of the feudal nobility. It assumed a public character in 1485, when it was organised by Ferdinand and Isabella as a local police with judicial functions; at the same time it received the name of Hermidad. As the royal power grew and that of the nobles declined, the Spanish sovereigns no longer needed the support of the burgher class, and the Hermidad gradually fell into decay.

Hermann, JOHANN GOTTFRIED (1772-1848), a German philologist, was born at Leipzig. He studied law there and at Jena, and in 1794 began to lecture at Leipzig on ancient literature, being further appointed successively to the chairs of philosophy, elocution, and poetry before 1810. He was a good lecturer, and did much to improve the study of Greek grammar, and published editions of the Greek tragedians, which involved him in controversy with contemporary scholars. Among his works are *De emendanda ratione Græcæ Grammaticæ*, *Handbuch der Metrik*, and *Epitome Doctrinæ Metricæ*.

Hermann, KARL FRIEDRICH (1804-55), a German philologist, born at Frankfurt-on-Main. He was educated at Heidelberg and Leipzig, and held professorships at Marburg and Göttingen. He endeavoured to make philology and history mutually illustrate each other. He made valuable researches into the Platonic philosophy and its history, and published the *Dialogues*, a *Handbook of Greek Antiquities*, some editions of the classics, and many other works.

Hermannstadt, a town of Hungary lying amidst hills N. of the Transylvanian Alps, 54 miles S.E. of Klausenburg. The ancient fortifications,

which once rendered it a strong city, are almost gone. It is divided into the High Town, well built, with good squares and regular streets, and the Low Town, reached by flights of stone steps from the High Town, and there are three suburbs. Among the public buildings are a 14th-century church with lofty tower and interesting monuments, a Roman Catholic church, a town hall (formerly a fortified house), a palace with a good library and paintings, a university, a law academy, and two gymnasiums. The chief manufactures are woollen cloth, leather, soap, cordage, hats, combs, and earthenware, and there is a brisk trade with Constantinople.

Hermaphrodite (a name derived from the legend that Hermaphroditus, the son of Hermes and Aphrodite, was united with the nymph Salmacis into one body), a term used in zoology to show that an animal has but one sex, the male and female reproductive organs being united in the same individual—*e.g.* the common hydra.

Among plants it is a purely structural term, equivalent to bisexual or monoclinal, being used of flowers which contain both stamens and carpels, as opposed to diclinous. It does not at all necessarily imply that the flower is self-pollinating, the two kinds of organs, in fact, very often maturing at different times. [DICHOGAMY.]

Hermas, an early theologian called an "apostolic" father, from his having lived almost if not quite in apostolic times. His writings consist of some fragments of a dialogue entitled *The Shepherd*, which was greatly revered in the 2nd century, and of which a perfect Latin translation was found in Rome. It is divided into *Visiones*, *Mandata*, and *Similitudines*, and is poetic in style and Platonic in ideas.

Hermes, a god of Greek mythology, corresponding to the Roman Mercury, was the son of Zeus and Maia, the daughter of Atlas, and was born in Arcadia. Wondrous stories are told of his infancy. At the age of eight hours he is said to have invented the lyre, which he hid in his cradle, and soon after stole fifty of the gods' oxen guarded by Apollo, driving them backwards to blind the trail, and having slain two by the river Alpheus he made a fire, sacrificed a portion of them, and hid what he did not eat in a cavern. Apollo suspected him of the theft and went to Maia, but Hermes pretended to sleep in his cradle. Zeus made him acknowledge the theft, but when Apollo bound his hands, the chains fell off, and the oxen appeared two by two. Hermes afterwards charmed Apollo by his playing, and the two made a compact of comradeship. Hermes became the herald and messenger of the gods, and countless stories are told of his cunning tricks. He was also the god of eloquence, and the patron of inventors, and of roads and travellers. Our own milestone finds its origin in the statues of Hermes, known as *Hermæ*, which were placed on the roads to mark distances. Hermes is generally represented as slender and full of youthful grace, with winged cap and ankles, and carrying the caduceus

(q.v.). But he has many symbols for his different characters. His festival was called Hermæa.

Hermes, GEORG (1775-1831), a German theologian, was born in Westphalia. In 1792 he studied theology at Munich, and in 1807 became professor of dogmatic theology in the university, and tried to carry out in a measure the principles of Kant, though he defended Christian dogma against them. In 1820 he became professor of Catholic theology at Bonn, and lectured with a view to reconciling Catholics and Protestants. His views took the name of Hermesianism, and his disciples started a magazine to embody them. In 1835 his views were condemned as heretical. He founded revelation on reason, but held that reason cannot prove dogmas. In 1819 he published *Philosophical Introduction to Christian Catholic Theology*.

Hermetic Books, the sacred canon of the ancient Egyptians, so called because they were supposed to have been composed by the god Thoth, "the scribe of the gods," who received from the Greeks the name of Hermes Trismegistus. According to Clemens Alexandrinus there were 42 such books divided into six sections. The first four treated respectively of (1) the nature of the gods, laws, the education of priests, (2) sacrifices, liturgical ceremonies, processions, (3) cosmography and geography, (4) astronomy and astrology; the fifth section included a collection of sacred songs, and an account of a ruler's life and duties; the sixth section was devoted to medicine. Some of the fragments preserved in Stobæus and other ancient writers are said to show traces of Neoplatonic influence. The *Book of the Dead* apparently belonged to the 2nd section; the Ebers papyrus, supposed to have been written about 1500 B.C., formed part of the sixth.

Hermit, or EREMIT (from Greek *eremia*, a desert), a name given originally to those who, amidst the moral decay of the Roman Empire, withdrew into the desert, hoping by a life of mortification to escape the expected judgment of God. During the fourth century hermit cells became common in the deserts first of all of Egypt and afterwards of Syria and Palestine. The most famous of these early hermits was St. Anthony (q.v.). The hermit life remained the ideal life of the Christian until it gave way to that of the convent.

Hermit Crabs, a general name to include the commonest of the Anomura, a division of the Decapoda (*Crustacea*) (q.v.), in which the abdomen is intermediate between the long-tailed form of the lobster and the short-tailed of the crab. There is, however, no doubt that this group is an artificial assemblage, including some of both the long-tailed (*Macrura*) and short-tailed (*Brachyura*) Decapoda. The Hermit Crabs are now assigned to the *Macrura*, as they have a fairly well-developed, though soft and unprotected, abdomen. As a consequence of this some protection is necessary, and is gained by the animal living inside an empty whelk shell. They are common on shell-banks all round the English coast.

Herne the Hunter, a legendary character who has long been connected with Windsor Forest. Shakespeare has immortalised him in the *Merry Wives of Windsor*, and Harrison Ainsworth has followed in the same track. His oak was blown down in 1863 after standing, it is said, for some centuries.

Hernia. The term hernia is applied to the condition, popularly known as "rupture," in which a portion of the abdominal contents (intestine or omentum) escapes from the cavity of the abdomen through some weak spot in its bounding wall. There are certain situations in which a hernia is especially liable to occur, either from some defect of development, in which case the malformation exists from birth and the hernia is said to be congenital, or from some anatomical peculiarity which leads to a liability to protrusion at certain points of the wall of the abdomen. Such situations are the inguinal canal (inguinal hernia), the crural canal (crural or femoral hernia), the umbilicus (umbilical hernia), and rarer forms are those known as obturator hernia, lumbar hernia, sciatic hernia, and diaphragmatic hernia. The parts of a hernia are first, the sac, consisting of peritoneum; second, the contents of the sac (usually small intestine); and third, the skin and other tissues covering the sac. Roughly speaking, out of every hundred cases of hernia 84 will be of the inguinal, 10 of the femoral, and 5 of the umbilical variety. The inguinal form is much more common in men than in women, while in femoral hernia the reverse is the case. The tendency to hernia may be inherited. The determining cause of the rupture may be some sudden act of exertion. Hernia is classified under five heads. (1) *Reduceible* hernia. This is much the most common form, and derives its name from the fact that the contents of the sac can be readily displaced and returned into the abdominal cavity, *i.e.* reduced. In such a condition a rounded regular pear-shaped swelling is met with, in which a distinct impulse is felt when the patient coughs, and which can be made to disappear by gentle manipulation, particularly when the patient is lying down. (2) *Irreduceible* hernia. Here the same characteristics are present, save that the contents of the swelling cannot be returned to the abdominal cavity. (3) *Incarcerated* hernia is a form of rupture in which the intestine occupying the hernial sac becomes blocked, the tumour cannot be reduced, the impulse on coughing is retained, and there is an absence of those constitutional symptoms which appear in strangulated hernia. (4) *Inflamed* hernia is the condition in which inflammation is set up in the tissues surrounding the protrusion. (5) *Strangulated* hernia. In this form of hernia there is an obstruction to the passage of the contents of the intestine through that portion of the canal which has escaped into the sac, and there is an obstruction to the blood supply of the prolapsed portion of gut. This state of things is generally brought about by a sudden increase in the extent of the protrusion caused by exertion. Strangulated hernia differs from the last-named varieties in that the impulse on coughing

is lost, and the condition is attended with grave constitutional symptoms, the most characteristic of which are pain, absolute constipation, and vomiting. If the circulation of blood in the prolapsed intestine be not speedily restored the constricted gut becomes gangrenous and sloughs. The treatment of reducible hernia is two-fold. The most common plan is merely palliative, and consists in the use of a truss. In some instances what is called a radical cure can be effected. In the irreducible form a *bag truss* may be employed, or more usually an operation is recommended with a view to effecting a radical cure. The treatment of the remaining varieties is a matter which cannot be here discussed, and in conditions of such gravity professional advice must, of course, be obtained without delay. It is most important that a patient should on no account neglect a rupture, as the use of a suitable truss from the outset may obviate the subsequent occurrence of any complication, and is in some instances in itself sufficient to produce complete cure of the condition.

Hero. 1. An ancient priestess of Aphrodite at Sestos in Thrace. Tradition says that Leander of Abydos, while present at a festival at Sestos, fell in love with the young priestess, and that his love was returned. He used to swim across the Hellespont to visit her, she meanwhile placing a lighted torch in a tower to guide his course. On one occasion the light went out, and Leander, missing his course, was drowned, and his body was washed to the foot of the tower. Thereupon Hero ascended the tower and, throwing herself from the top, died with her lover.

2. A mechanician and mathematician of Alexandria, who flourished about 215 B.C. He left two books on the construction of automata, published at Venice in 1601. Other works of his are lost or exist only in fragments. He is said to have made air machines, and engines for use in war, and to have made many discoveries in dioptries. He also invented a steam-engine of a simple kind (q.v.), a double-force pump, and the contrivance which is called Hero's fountain (q.v.).

Hero-children, the name given by anthropologists to children of whom one parent was reputed to be divine (as Remus and Romulus), or whose births were attended with portents (as Cyrus), and who, on attaining manhood, became national heroes.

Herod the Great (73-4 B.C.) was the second son of Antipater the Idumean, who was Procurator of Judæa and made his son governor of Galilee. Herod in the civil troubles of Rome sided with Brutus and Cassius, but his talents led to his finding favour with Antony, who made him Tetrarch and King of Judæa, a position in which Augustus confirmed him after the downfall of Antony. Although a sound politician and a good general, he was a man of jealous nature and violent passions. He killed his brother Aristobulus, and Hyrcanus, the grandfather of his wife Mariamne, and finally killed her, the rest of her family, and his sons by her, so determined was he to have no rivals near

his throne. He displayed great magnificence in his surroundings, rebuilt the Temple, built a theatre and amphitheatre for Jerusalem, and rebuilt on a grand scale Samaria. He also erected strong fortresses in his dominions, of which Cæsarea was an example. Besides a fine palace at Jerusalem, he had a country house, the Herodeion. He incurred much odium by the massacre of infants at Bethlehem, another mark of his dread of rivalry; but, on the whole, he was a favourite with the Jewish nation, though they suffered from his despotism. In his later days disease made him, as later it did Henry VIII. of England, doubly vindictive, and one of his latest acts was one of almost humorous madness—namely, to summon the chief Jews to Jericho, leaving orders to Salome that they should be slain at his death in order that there should be some to mourn him, unless, indeed, he had deep motives of policy for the act as likely to paralyse any effort at revolt when his strong hand should be removed from the helm.

Herod Antipas, son of Herod the Great, was Tetrarch of Galilee. He it was who beheaded St. John the Baptist. He was dismissed from his rule by Caligula, and died in exile in France or Spain in 40 A.D.

Herod Agrippa I. was the grandson of Herod the Great, his mother, Bernice, being that king's daughter. Brought up with Drusus, he fell into disgrace with Tiberius, and therefore found favour in the eyes of Caligula. He died of a malady said to have carried off other tyrannical rulers of antiquity (Acts xii.).

Herod Agrippa II. was too young to exercise his father's power, so his charge was reduced to a province. It was before him and his wife-sister Bernice that St. Paul pleaded. He afterwards gave valuable aid to Titus in his schemes, and died at Rome A.D. 94.

Herodiones, in some classifications a group of birds corresponding to Huxley's *Pelargomorphæ* (q.v.).

Herodotus, "the Father of History," was born in B.C. 484 at Halicarnassus in Asia Minor. There was talent in the family, for his uncle was a poet. He soon set out on his travels, first visiting Egypt, then more than now the home of mystery, and just beginning to be opened to Greek curiosity, and passing on to Libya, Palestine, Babylon, Scythia, Thrace, Macedonia, and Epirus, and so home to Caria, where he found political disorder raging that drove him to the island of Samos. Returning to Halicarnassus, he with others drove out Lygdamis, who had usurped the supreme authority, but the succeeding aristocratic government was little better, and those for whom he had worked taunted him with doing them more harm than good. In disgust, therefore, he retired to the Greek colony of Thurii in Italy to find there the tranquillity which should enable him to carry out the great work of his life. Some say that he wrote his history at Halicarnassus, and read it at the Olympic Games in 456 B.C., so charming the audience that they applied the names of the Muses

to the different parts of his work, and so working on the emotions of Thucydides, then a boy of fifteen, as to make him weep, and determine him on the course of life-study which made him the other great historian of Greece. He is said to have read his history at Athens in 446 B.C., and to have received a prize of £2,500 for it. Pliny was of opinion that he wrote at Thurii, and completed his history to 409, but as it stands it ends very abruptly, and suggests that he died leaving it unfinished, early in the Peloponnesian war. Beginning with the struggle of the Greeks and Persians, the clashing of the East and West, Herodotus searches into the mythical stories of mutual outrage that led to the conflict. This carries him to Lydia, whose history he relates down to the fall of Cræsus before the rising power of the Persians, and the subjugation of Asia Minor leads to the introduction of Babylon, and the life of Cambyses introduces Egypt, and that of Darius takes us among the Scythians. So the extension of the Persian kingdom leads to the treatment of Cyrene and Libya, and by a natural sequence of events we arrive at the Ionian revolt, and the struggle between Greece and Persia. Everywhere, however, there are minor digressions on the slightest provocation. No account can convey any idea of the simple charm of Herodotus' style to those who have not read him in the original, or at least in a good translation, and modern research (except perhaps in the case of Egypt) has amply vindicated his character for truthfulness in matters which came under his own observation. Some excellent editions of his history with valuable comments and illustrations have been issued, and among Englishmen the brothers Rawlinson have done much towards increasing our knowledge of the subjects of which Herodotus treated, and also of his own merits.

Heroes, in classic mythology, originally men distinguished above their fellows for strength, courage, or wisdom. Later it was fabled that such persons were partly of divine origin—Perseus was the son of Zeus, and his mother the mortal Danaë; Æneas was the son of Venus, and his father the mortal Anchises. Heroes were honoured with a cultus, generally local, and in some respects corresponding to the honour paid to Christian saints.

Heron, any bird of the genus *Ardea*, type of the family Ardeidæ, allied to the Storks, but having a large hind toe, and the inner margin of the middle toe pectinated. There are four other genera: *Nycticorax* [NIGHT HERONS], *Tigrisoma* [TIGER BITTERNS], *Botaurus* [BITTERNS], and *Carcroma* [BOAT-BILL]. The true herons (*Ardea*) comprise about sixty species, and are cosmopolitan. Most of them are large birds with a thin body, long neck and beak, and more or less sombre plumage, though in the egrets (sometimes made a separate genus. *Herodias*) it is white. The common heron (*A. cinerea*) ranges from Britain, through Europe, to Eastern Asia. It is about three feet long, bluish-grey above, white beneath, the breast black, with a white patch in front; the throat is white, streaked with black, the colour of the quill feathers;

the tail slate-colour; and there is a pendant black crest. They are usually solitary, except at the breeding season, when numbers of them nest together. *A. purpurea*, the Purple Heron, a rare British visitor, is from Central, and *A. æquinoctialis*, the Buff-backed Heron, from Southern Europe. The Green Heron (*A. virescens*), the Great Blue Heron (*A. herodias*), and the Great White Heron (*A. occidentalis*) are American. Probably the largest species is the Goliath Heron (*A. goliath*) from Africa. The Peacock Heron, or Sun Bittern (*A. helius*), from South America, where it is often kept as a pet, is of small size and variegated plumage. The Great Egret (*A. alba*) and the Lesser Egret (*A. garzetta*), formerly a native, occasionally stray to Britain.

Hero's Engine, made first by the ancient philosopher of that name, is a steam-engine working on the principle of Barker's mill (q.v.), but forcing steam out of lateral jets in the vessel instead of water. The momentum of the issuing steam causes a retrograde rotation of the vessel which is pivoted so as to move with freedom. *Hero's Fountain* is a contrivance for forcing a small jet of water into the air by means of compressed air, the compression being produced by a difference of water-level.

Herpes, a vesicular affection of the skin. The bladders or vesicles of herpes vary in size from that of a pin's head to that of a split pea. They are usually distributed along the course of distribution of some nerve. In the common form known as "shingles," one of the cutaneous branches of an intercostal nerve is involved. Herpes also sometimes affects the lips, the neck, or one of the limbs. The eruption is sometimes attended by pain. After the lapse of a few days the bladders dry up, scabs are formed, and the disease is at an end. No treatment is called for beyond protecting the affected parts; this result is best attained by painting them all over with a solution of collodion.

Herrera, FERNANDO DE (1534-1597), a Spanish poet, commonly called "El Divino," was born at Seville. His style was formed on classic and Italian models, and his works consist chiefly of odes and love poems. He also wrote much in prose, but several of his works are lost. There are two editions of his poems (1581 and 1619), but they are seldom to be met with. Among his prose works is a narrative of the wars of Cyprus.

Herrera, FRANCESCO (circa 1576-1656), a Spanish painter of the Seville school, known as "El Viejo," to distinguish him from a son, also a painter of some note, and the founder of a new and powerful school of painting. Among his best works are *The Last Judgment* and a *Holy Family*, both in churches in Seville. He also adorned the dome of St. Bonaventura with fresco, and was renowned as a painter of common life and for bronze-work, statuary, and architecture. Some of his best works are in the Louvre.

Herrick, ROBERT (1591-1674), an English poet, was born in London, where his father was a goldsmith, and educated at Cambridge. He came

to London in 1620, and there made the acquaintance of Ben Jonson and his circle; but in 1629, apparently against his taste, he took orders, and was relegated to an out-of-the-way living in Devonshire, where, nevertheless, he seems to have worked well and to have been appreciated. From 1647-62, during the Puritan ascendancy, he was in London, returning afterwards to his parish. His poems were published in one volume, containing the *Hesperides* and some half-hearted religious poems called *Noble Numbers*, though even in these latter there are some noble pieces. But it is the former that show the great charm of his manner, which is almost Shakespearean. *Oberon's Feast*, *Oberon's Palace*, *Gather ye Rosebuds*, *Cherry Ripe*, *Bid me to Live*, and the like, are universally known and as widely admired.

Herring, a book name for the Physostomous Teleostean family Clupeidæ, dating back to the Chalk formation. The body is covered with scales, the head is naked, and barbels and adipose fin are wanting. The single dorsal is short, and the anal fin is also single. The stomach is furnished with a blind sac, and the pyloric appendages are numerous. The gill-openings are generally very wide, and the air-bladder is more or less simple. The Clupeidæ are principally coast fishes, widely distributed in temperate and tropical seas. The type-genus *Clupea* has more than sixty species, with the distribution of the family. The body is compressed, and the abdomen is serrated as far as the thorax. The anal fin is of moderate size, and the dorsal is opposite to the ventrals. To this genus belong the Common Herring (*C. harengus*), the Shads (*C. alosa* and *C. finta*), the Alewife (*C. mattaroca*), the Pilchard (*C. pilchardus*) and the Oil Sardine (*C. scombrina*), with many others economically important for food, or as yielding oil. Some of the tropical forms are more or less poisonous if eaten. The common herring may be easily recognised by its smooth gill-cover and the ovate patch of minute teeth on the vomer. It is found in vast numbers in the North Sea, the northern parts of the Atlantic, and the seas to the north of Asia. The herring fishery is a very important one, especially on the British, Norwegian, and Dutch coasts, and commences when the fish come into shallow water to spawn. This season varies in different places. In the outer Hebrides the fishery is forbidden by law before May 20th, but in the Shetland Isles it rarely commences before July. Off the west coast of England herrings are plentiful in October and November, and they appear to spawn off the south coast in January only. August and September are the best months at Yarmouth, the headquarters of the fishery in England and the seat of the trade for curing herrings.

Herschel, SIR JOHN (1792-1871), an English astronomer, son of Sir William Herschel, was born at Slough, and educated at Eton and Cambridge. In 1813 he graduated B.A., as Senior Wrangler and Smith's prizeman. In 1820 he published a work on the application of the calculus to Finite Differences. In 1822 his father died, and he

thenceforward applied himself to astronomy, among his first works being an examination and description of the nebulae and clusters discovered by his father. In 1823 he wrote the article on Physical Astronomy for the *Encyclopædia Metropolitana*, to be followed up at intervals by other articles in that and other cyclopædias. Articles on sound and on the theory of light had already appeared in the above-mentioned encyclopædia. From 1834-37 he was at the Cape in order to study the stars of the Southern Hemisphere, and the results of his expedition were published in 1848 at the expense of the Duke of Northumberland. In 1838 he became D.C.L. of Oxford and baronet, and in 1848 President of the Royal Astronomical Society. From 1850-55 he was Master of the Mint. Besides his astronomical pursuits, he found time to write poems, and in 1866 he published a translation of the *Iliad* in hexameters. His articles to the *Edinburgh* and *Quarterly Reviews*, and addresses to the Astronomical Society and the British Association, were published in 1857.

Herschel, SIR WILLIAM (1738-1822), was the son of a Hanoverian musician, and at fourteen entered the band of the Hanoverian Guards. In 1757 he came to England, and was commissioned to form a military band, and did duty as an organist at Bath, where he also conducted concerts. He gave his leisure to mathematics and astronomy, and set about making a telescope of five feet, which he finished in 1774, going on to construct others of seven, ten, and even twenty feet. He gradually withdrew himself from the musical profession, and in 1779 began to observe, with his 7-in. telescope, the planet *Uranus*, at first called Georgium Sidus, in honour of the king, who granted him a pension. In 1787 he finished his forty-feet telescope, and his observations with this led to many notable discoveries, among them being the discovery of volcanic mountains in the Moon, Saturn's satellites, and those of Uranus, the rotation of Saturn's rings, of Saturn, and of Venus, the existence of binary stars, and some facts as to Ceres, Pallas, Juno, and Vesta. He was aided in his work by his sister CAROLINE, herself no mean astronomer, and by his brother, an optical-instrument maker. In 1802 he put before the Royal Society a catalogue of 5,000 new nebulae, clusters, etc. His merits were recognised by the bestowal of knighthood and the degree of D.C.L.

Herschel Telescope is a special form of reflecting telescope, possessing the advantage of great simplicity, but only adapted for large instruments and for observation of nebulae or of such other objects as chiefly require light-giving power. The large concave reflector is placed at the end of the tube, so that light from the heavens is reflected back; a slight tilting is given to the mirror, so that the reflected image is brought to one side of the tube, and the observer introduces his head actually into the tube to examine this image. The amount of light intercepted by his head is a fatal objection if the aperture of the telescope is small. Herschel's instrument of 1789 had a four-feet aperture. The obliquity of the mirror spoils the definition of the

image, and heat from the body of the observer is also found to introduce difficulties. [TELESCOPE.]

Hertford, market town and capital of Hertfordshire, on the Lea, nineteen miles north of London, and on the Great Northern and Eastern Counties railway systems. It consists of three principal streets meeting in a central square. It possesses a free library, shire hall, corn exchange, free grammar school, county and borough police offices, and infirmary, and there are several almshouses and other charities. The chief industries are malting and brewing, trade in corn, coal, and timber, and there are oil and flour mills, some of the latter being on the Lea. Hertford is a place of some antiquarian interest, a national ecclesiastical council having met there in 673, and a Saxon king having built there a castle, afterwards inhabited by John of Gaunt, the queens of Henry IV., V., VI., and Elizabeth. Here, too, John of France and David of Scotland were imprisoned.

Hertfordshire, an inland county, having Cambridge on the north, Middlesex on the south, Essex on the east, and Bedford and Bucks on the west. It is 38 miles long from S.W. to N.E., by a width of 20 miles, and contains 405,000 acres, of which 350,000 are arable, meadow, or pasture. The surface consists of hill and valley, the chalk hills of the north rising to a height of 900 feet, and there is much wood, and abundance of parks and seats. The climate is agreeable. The soil is for the most part loam and clay, but the centre is in places gravelly. Most of the cultivated land is arable, the chief crops being good wheat and barley, oats, turnips, and grasses; and the meadows produce good hay. In the S.W. there are cherry and apple orchards. There is not much live stock, and the sheep are mostly of Southdown and Wiltshire breeds. The chief industries are malting, paper-making, straw-plaiting, and ribbon-weaving. There are four parliamentary divisions, returning one member each. The four northern railways provide railway accommodation for the county.

Hertz, HENRIK (1798-1870), a Danish poet, was born at Copenhagen. In 1817 he entered the university as law-student, but soon gave himself to literature. His earlier works were anonymous, and consist of comedies, a vaudeville, and a satire which made some commotion. In 1833 he went, by aid of a travelling pension from the Government, to Italy, France, and Germany, entering on his return upon an active literary life. Besides many other works, both comedies and tragedies, he wrote several novels. Theodore Martin translated his *King René's Daughter*.

Hertzian Oscillations. Of recent years Maxwell's theory of the electro-magnetic ether has been gaining considerable ground, both experiment and calculation confirming the statement that radiation through the ether is of the same nature, whether it manifest itself as light energy, heat energy, or electrical energy. [MAXWELL'S THEORY.] The only important difference that exists between these kinds of radiation is that, while all are wave-motions of some sort, the waves are not all of the

same length and frequency. Those oscillations due to electrical displacements, frequently called Hertzian oscillations, are of greater wave-length and less frequency than those due to the passage of what is called red light, and these latter again are of greater wave-length and less frequency than those due to violet light. Inasmuch as the eye is only capable of distinguishing waves of such frequencies as lie between the red and violet limits, it cannot recognise electro-magnetic radiation, which therefore requires another sense to distinguish it. The case is similar to that of a vessel of hot water in a dark room; this is radiating dark heat, indistinguishable to the eye but readily detected by the sense of touch. Dr. Hertz of Carlsruhe has succeeded in showing experimentally that electrical oscillations may be transmitted through a suitable dielectric or non-conductor, and that the waves thus produced may be reflected from or refracted through plane or curved surfaces in precisely similar fashion to the reflection or refraction of light-waves. [LIGHT, RADIATION.]

Hervey, JAMES (1714-58), an English clergyman and author, was born near Northampton, and was educated at Oxford. He took orders, and was appointed curate of Dummer in Hampshire in 1736. In 1738 he went to Stoke Abbey, Devon, and here it was that he planned the *Meditations* by which he is chiefly known, and which were composed among the tombs of a Cornish churchyard. His works were published in six volumes, and his letters and memoir in 1760.

Herz, HENRI, pianist and composer, was born at Vienna 1806, and, after studying at Paris and visiting England and America, was professor of music at the Conservatoire of Paris (1842-74). He was also a successful piano-maker. He died in 1888.

Herzen, ALEXANDER (1812-70), a Russian writer, was born in Moscow, and educated at the university there, where he imbibed philosophical and socialistic views. In 1834 he was imprisoned for joining in a song against the emperor, and was banished to Siberia. By the intercession of the Grand Duke Alexander he was allowed to live at Vladimir, and in 1839 he was set free, and was appointed secretary to Count Strogonoff, Minister of the Interior. His advanced views again displeased the Government, and he was sent to Novgorod, where he was made Imperial Councillor. The death of his father in 1847 gave him the means of obtaining leave to travel, and he left Russia for ever. He visited Italy, France, England, and Switzerland, and died at Paris. He was patriotic, and devoted to the advancement of the Slavonic races. In 1857 he started a journal *Kolokol*, in London, removing it afterwards to Geneva. Among his works were letters, novels, memoirs, and translations.

Hesiod, one of the earliest of Greek poets, was born at Cyme in Æolia. As a boy he went to Ascra in Boeotia, whence he is sometimes called "the Ascrean," and is said in later life to have practised divination in Acarnania and to have been a priest

in the temple of the Muses at Mount Helicon. He afterwards went to Locris, where he was murdered and thrown into the sea; but dolphins brought his body to the shore, thus leading to the discovery and punishment of his murderers. His date is unknown, but is sometimes put at 900 B.C. His works are the *Theogony*, a history of the origin and deeds of the gods. Fragments, too, exist of a work called *The Shield of Hercules*, which was probably part of a larger work; but the *Works and Days*, an epic dealing mainly with rural life, is the best known of all his productions, and was by the Bæotians considered the only genuine one of those attributed to him. This has been translated into English verse and prose.

Hesperidæ, a family of butterflies known as the "Skippers," the members of which occur mainly in tropical America. There are seven English species, of which *Pamphila sylvanus* (Linn.) is one of the largest. The "Lulworth Skipper" is of interest only owing to its occurrence at but one locality. The popular name is derived from their brisk, jerky flight.

Hesperides, THE, were in Greek mythology the guardians of the golden apples which Ge gave to Hera. They were, according to Hesiod, "daughters of the night," according to other accounts daughters of Atlas or of Zeus and Themis, or Ceto and Phorcys. Their names also differ according to different legends, but those generally adopted are Ægle, Arethusa, and Hesperis. The garden containing the apples was in an island of the ocean near the Hyperborean Atlas. They were aided in their task of guardianship by the dragon Ladon. This dragon Hercules killed, and, having taken the apples, he gave them to Athene, who afterwards restored them to the sisters.

Hesperidine, a compound $C_{22}H_{26}O_{12}$ which occurs in unripe oranges, lemons, and other fruit. It forms a white, tasteless, insoluble powder, which, on boiling with dilute acids, yields a compound, *Hesperetin* $C_{16}H_{14}O_6$, together with grape sugar



Hesperidium, so named from the legend of the golden apples of the Hesperides, is the technical term for the fruit of the orange tribe, a superior polycarpellary syncarpous succulent fruit, belonging to the nuculane type. It has a leathery epicarp, studded with oil-glands, a white woolly mesocarp and a thin membranous endocarp dividing the numerous carpels, which are each usually two-seeded. From the inner surface of this endocarp are produced rows of large spindle-shaped cells, filled with watery acid or sub-acid juice, which fill the carpels as the pulp of the fruit.

Hesperornis, a genus of fossil birds, including several species, described by Professor O. C. Marsh, from the Middle Cretaceous rocks of Western Kansas. They were huge fish-eating Divers, nearly six feet high, with a perfectly flat breast-bone, without a vestige of a keel, and there were apparently not even rudimentary wings. The tail is elongated, somewhat as in *Archæopteryx* (q.v.),

and the long jaws are armed with numerous teeth in a common groove as in *Ichthyosaurus*.

Hesse, formerly a district of Central Germany, in Roman times the home of the Teutonic tribe of Catti, whose chief town, Mattium, was destroyed by Germanicus. Under the Frankish kings it was governed by counts, and in the Middle Ages it formed part of Thuringia, belonging in 1263 to Sophia, wife of Henry of Brabant. With her son Henry began the dynasty of Hesse, which later split into four branches, which by failure of issue diminished to two in the early part of the 17th century. From these two came the divisions Hesse-Cassel and Hesse-Darmstadt. The former, now almost absorbed into the Prussian province of Hesse-Nassau, was founded in the 16th century by the Margrave William IV. It sided with Austria in 1866, and was annexed. Hesse-Darmstadt is a Grand Duchy, partly drained by the Eder and Fulda into the Weser. Much of it is cold and unproductive, but the climate of the river-valleys is mild and pleasant, and the vine is extensively cultivated, together with much fruit, corn, hemp, flax, potatoes, rape-seed, tobacco, and hops. There is also much forest land. Agriculture and cattle-rearing are the chief industries, and horses, cattle, sheep, and swine are abundant. Linen is manufactured, and salt, basalt, whetstones, lime and sandstone are quarried. The chief towns are Darmstadt (capital), Mainz, Giessen, Bingen, and Worms.

Hesse-Nassau is a Prussian province made up of the greater part of Hesse-Cassel, part of Hesse-Homburg on the W. of the Rhine, most of the ancient duchy of Nassau, small parts of Hesse-Darmstadt and Bavaria, and the territory and town of Frankfurt, containing in all 6,018 square miles, divided into the government of Cassel, which nearly corresponds with Hesse-Cassel, and contains 3,914 miles, and that of Wiesbaden, which nearly corresponds with the Duchy of Nassau, and contains 2,104 miles. The country is generally rugged, and is occupied in the north by the Harz Mountains, which rise to a greatest height of 3,600 feet. It is drained by the Fulda, Werra, and other rivers flowing into the Weser, and the Lahn, Ohm, and Main flowing into the Rhine. The climate of the higher regions is severe, but in the Rhine valley the best German wines are produced. Three-fifths of the soil in the valleys and mountain slopes is arable, and there is an improving agriculture, though some of the soil is poor, that of Nassau being the best. Potatoes are largely cultivated and used for food, and there is much barley, rye, and oats. Fruit is tolerably abundant, and the forests are extensive. Woollen, cotton, and linen are manufactured, and there are some minerals, while Homburg and Wiesbaden are noted for their mineral waters. The chief towns are Cassel (capital), Wiesbaden, and Frankfurt.

Hessian Crucible. [CRUCIBLE.]

Hessian Dyes. A number of dyes are known under the names of Hessian purple, and compounds termed Hessian-violet and Hessian-yellow are also used as colouring materials. They are all

compounds of very complicated structure, and are derivatives of a hydrocarbon of composition $C_{14}H_{12}$ known as *Stilbene* (q.v.).

Hessian Fly, a small brown fly known as *Cecidomyia destructor* (Gay), and belongs to the family *Cecidomyiidae*. It deposits its eggs on wheat plants. The maggots, when hatched, work their way down to the base of the leaves and there feed on the sap. Many authorities believe it was carried to America by the Hessian troops during the War of Independence, whence its popular name. It now does serious damage in that country.

Hesychius, a grammarian of the fourth century A.D., is supposed to have been a native of Alexandria. He produced a *Lexicon*, partly original and partly compiled from older ones. It is considered the best of the early lexicons, and has great antiquarian value. A good edition was published at Leyden in 1746-66, and the supplements of Schow, Leipzig (1792), and of Schmidt, Jena (1857-64), are of value.

Heterocera, the division of insects including the Moths (q.v.).

Heterocercal. [FISHES, vol. iv. p. 305.]

Heterocœla, a division of the calcareous sponges, including those in which the collared cells are restricted to ampullæ or special cavities. [HOMOCœLA.]

Heterœcism, in fungi, or other parasites, is the passing different stages of development on distinct hosts. A striking instance is the corn-mildew (*Puccinia graminis*), which at one stage is known as the cluster-cup of the barberry, formerly named *Æcidium berberidis*, whilst other stages, one once named *Uredo*, and the other and final one known as *Puccinia*, occur on wheat or some other grass.

Heterogamy, a method of reproduction met with in some insects; it unites parthenogenesis (q.v.) with alternation of generations (q.v.).

Heterogony. [HETEROSTYLY.]

Heteromorphæ, in Huxley's classification, a group of birds containing the Hoazins. [HOAZIN.]

Heteromya, a subdivision of the bivalve mollusca (*Lamellibranchiata*) in which the shell is closed by two adductor muscles, of which the anterior is much the smaller.

Heteropoda, a subdivision of the Gastropoda (q.v.) in which the foot is modified to form a swimming organ.

Heteroptera, a division of Rhynchota (q.v.), including those with the anterior pair of wings membranous at the ends but hard and chitinous at the base, known as hemelytra (q.v.). The group is divided into two subdivisions—the Water-bugs (*Hydrocorisæ*), and Land-bugs (*Geocorisæ*). The best-known forms are the Water-measurers (*Hydrometra*), Water-scorpions (*Nepa*), etc.

Heterospory, the production by the same plant of two different kinds of spore, as opposed to homospory or isospory. The term is chiefly employed with reference to the Pteridophyta (q.v.), and the distinction was until recently used as the

fundamental basis for the subdivision of that sub-kingdom. It is now recognised, however, that there are four natural classes in it: the Filicineæ, including the homosporous ferns and the heterosporous Rhizocarps (q.v.); the Equisetinæ, including the homosporous horsetails (q.v.), and the heterosporous fossil *Annularia* and *Calamites* (q.v.); the heterosporous fossil Sphenophylleæ and the Lycopodinæ, including the homosporous *Lycopodium* and the heterosporous *Selaginella*, living, and *Lepidodendron*, fossil. Heterospory seems, therefore, to have originated several times independently. As it would seem to be the higher type, its abundant representation among Palæozoic plants is remarkable.

Heterostyly, or HETEROGONY, the possession of stamens and styles of different relative length in different flowers of the same species. In primroses and their allies *dimorphic* heterostyly occurs, one form, the *long-styled* or *pin-eyed*, having the stigma at the top of the corolla-tube and the stamens half-way down it, whilst in the other, the *short-styled* or *thrum-eyed*, their positions are reversed. The common purple loosestrife, *Lythrum Salicaria*, is an example of *trimorphic* heterostyly, *long-*, *medium-*, and *short-styled* forms occurring, each with two rows of stamens of lengths other than that of its own style. Darwin first showed heterostyly to be an adaptation to cross-pollination by insect-agency, corresponding parts of an insect's body touching the anthers of one flower and the stigma of another, whilst the pollen from any anther was *prepotent* on the stigma at a similar level.

Heterotricha, an order of Infusoria (q.v.), characterised by the cilia occurring as an investment to the whole body, while around the peristome (or mouth) there is a circle of longer cilia.

Hewett, SIR WILLIAM NATHAN WRIGHT, naval officer, was born in 1834, and served in the Burmese War of 1851. in the China War of 1857, and on shore before Sebastopol. Promoted to be captain in 1862, he was commodore on the coast of Africa during the Ashantee War. He was rear-admiral 1878, vice-admiral 1884; he died in 1888.

Hexacoralla, a group of corals (q.v.) of the class Madreporaria (q.v.), including all those "true corals" in which the septa are either six or are arranged in multiples of six. The group is divided into three orders, the Perforata, Fungida, and Aporosa. In the former the skeleton is loose and porous in texture as all the solid parts are perforated by numerous pores. *Madrepora*, of which the well-known stag's horn coral is a familiar example, is the principal genus of the Perforata. The Fungida are characterised by the possession of "synapticulæ"—small rods passing from the septa into the body chambers on each side. The mushroom coral (*Fungia*) is the type of this group. The Aporosa is the largest order; the calcareous structures are here solid. This includes the astrean corals, such as the Brain coral, and most of the simpler single corals such as *Flabellum*. Another classification has been prepared, based on the origin of the body wall, but so far it has not been

sufficiently worked out to be accepted here. The Hexacoralla is the largest existing group of corals. It is probable that most of the Palæozoic "Rugose" corals ought to be included within it.

Hexactinellidæ, a group of sponges having a siliceous skeleton composed of spicules, which are either united by the tips (*Dictyonina*), or which are separate from one another (*Lyssakina*). The spicules are six-rayed, and through the centre of the rays run three transverse canals. A series of many-rayed "flesh spicules" also occurs. The group is of great interest as, with very rare exceptions, it is at present limited to the deep seas, while in former periods it was very widely distributed. Thus many of the sponges of the Chalk or of the Lower Green-sand sponge banks belong to this group, while it is known in the Palæozoic. The best known recent member of the group is the "Venus Flower Basket" (q.v.), or *Euplectella*, which is a member of the *Lyssakina*. *Hyalonema* is another well-known form. It is surrounded at the base by a tuft of glass-like fibres, whence it has gained its name of the "Glass-rope Zoophyte." These anchoring fibres have long been known from the Carboniferous. *Hyalonema* was once regarded as a coral.

Hexagon, in geometry, is a six-sided figure. A regular hexagon has six equal sides, consecutive pairs of which contain six equal angles. The opposite sides of a regular hexagon are parallel, and can only be regarded as meeting at an infinite distance. The three pairs of opposite sides of any hexagon inscribed in any conic section intersect in three points which will always lie in a line. This is Pascal's theorem. Further, the three diagonals of a regular hexagon—*i.e.* the lines joining opposite angular points—pass through one point. If any hexagon be circumscribed about any conic the three diagonals will also be found to intersect at a point. This is Brianchon's theorem. [DUALITY, PRINCIPLE OF.]

Hexameter (Greek, *hex*, "six," and *metron*, "a measure"), a form of verse much used by the Greeks and Romans, especially in epic poetry. It is the metre of Homer's *Iliad* and *Odyssey*, and of Virgil's *Æneid*, *Georgics*, and *Eclogues*. In classical prosody the structure of verse was not regulated, as it is in modern poetry, by the *stress* or *emphasis* laid on words and syllables, but by quantity—*i.e.* by the shortness or length of the vowel in each syllable. A hexameter line was composed of dactyls (a long syllable followed by two short ones) and spondees (two long syllables), and contained six feet, of which the last was always a spondee and the last but one almost always a dactyl. Some attempts have been made to write English and German hexameters, substituting stress for quantity. Those of Longfellow in *Evangeline* and *Miles Standish* are among the most successful. The following line is from *Evangeline* :—

When she had | passed, it | seemed like the | ceasing of |
exquisite | music.

Hexameters alternating with pentameters (q.v.) form elegiacs, which were often employed by the Greeks and Romans in lyric poetry. The attempt

to translate Homer in hexameters was ridiculed by Lord Tennyson in burlesque elegiacs (which in quantity conform strictly to rule):—

"These lame hexameters the strong-wing'd music of Homer!
No—but a most burlesque barbarous experiment.
When was a harsher sound ever heard, ye Muses, in England?
When did a frog coarser croak upon our Helicon?"

Hexanes are hydrocarbons of composition C_6H_{14} belonging to the group known as paraffins (q.v.). Five different hexanes are theoretically possible; of these four are known, one occurring in petroleum. They are all liquids, of boiling-points varying from 43° to 71° . The corresponding alcohols $C_6H_{14}O$, of which eight are known, are termed *hexyl* or *caproyl* alcohols. Seven acids derived from them have been prepared, known as *caproic* or *hexoic* acids, with formula $C_5H_{11} \cdot COOH$.

Hexaprotodon, a fossil ungulate mammal with six incisor teeth, apparently a generalised ancestral form of the Hippopotamus family. It occurs in the older Pliocene rocks of the Siwalik Himalayas.

Hexham, a market-town of Northumberland, on the north bank of the Tyne, near the junction of the North with the South Tyne, crossed here by a stone bridge, 20 miles west of Newcastle, and on the Newcastle and Carlisle railway. The streets are mostly narrow, but there is a large market square containing a Moot Hall, once the court-house of the Bishop and Priors of Hexham. Only the transept and chancel of the old cruciform abbey church remain. Other public buildings are a free grammar school and an institute. The trade is chiefly local. The town is of great antiquity, being supposed to be the Roman Alexodunum. In the 7th century a monastery was founded here by St. Wilfrid, and the Scots burnt the town in the reign of Edward I. In 1761 there was a formidable and fatal riot arising out of the militia ballot.

Hexoses. [GLUCOSES.]

Heyne, CHRISTIAN GOTTLÖB (1729–1812), German philologist and antiquary, was born at Göttingen. His parents were poor weavers, and he suffered much from poverty during his university career at Leipzig. He made great progress in law and the classics, and was appointed librarian to Count de Dröhl, going to Dresden, where he came in contact with Winckelmann. The Seven Years' War brought him misfortune, but in 1763 he received an appointment at Göttingen as professor of eloquence. He founded a Society of Sciences, and managed well a philological seminary. He illustrated grammar and criticism by means of archæology and history, and both his teaching and his writings had great influence upon classical studies in Germany. He read the classics not as an end, but as a means of understanding ancient life and history. He issued no great original works, but many good editions of classical authors, notably Virgil.

Heyse, JOHANN LUDWIG PAUL, perhaps the greatest of living German novelists, was born in Berlin 1830. He was patronised by King Max of Bavaria, and became a prolific writer. Besides his

narrative and epic poems, he has written many plays, some of which have been successful, and many novels and novelettes, and has translated much from Italian authors. Among his novels are *Die Kinder der Welt*, and *Im Paradiese Meraner Novellen*; and *Das Buch der Freundschaft* contains many slighter novels, while *Ulrica*, *die Braut von Cypern*, and *Thekla* are good specimens of his poetry.

Heywood, a municipal borough of Lancashire, on the Roach, eight miles N.W. of Manchester. It is important for its cotton manufacture, all branches of which are carried on, and the manufacture of power-looms, iron and brass founding, and boiler-making employ many of the inhabitants.

Heywood, JOHN (*circa* 1500–66), an English dramatist, was born probably at St. Albans, and was educated at Oxford. He made the acquaintance of Sir Thomas More, and was by him introduced to the Princess Mary, becoming a favourite at Henry VIII.'s court and at that of Mary I. After her death he retired to Malines, where he died. He is notable as marking the transition from the old miracle plays to the Elizabethan drama. He wrote plays and poems, and made a collection of proverbs. His earliest play was printed in 1533, and was entitled *The Pardoner and the Frere: the Curate and Neighbour Pratte*. Another work was the *Spider and Fly*, a parable of Catholics and Protestants. An edition of his works was issued in 1562.

Heywood, THOMAS (fl. 1600–1630), a dramatist of the times of Elizabeth, James I., and Charles I., was born in Lincolnshire and educated at Cambridge. He wrote wholly or in part 220 plays, of which 24 are extant, and he ranks high among the playwrights of his time. Two of his best-known plays are a *Woman killed with Kindness*, and *Four London 'Prentices*. In 1856 J. Payne Collier issued in two volumes an edition of his works, with a life and remarks on his writings.

Hezekiah, the 12th King of Judah, reigned about 726–928 B.C. He succeeded his father Ahaz at 25, and, led by Isaiah, inaugurated a series of reforms, abolishing idolatry, and endeavouring to restore national independence and prosperity. He repaired and reopened the Temple, and abolished idolatry. He waged a successful war against the Philistines, but, failing to pay the tribute due to Assyria, he was besieged. Soon after this he was seized by a severe illness, and, after his recovery, incurred the anger of Isaiah by showing his treasure to the Babylonian envoy who had come to congratulate him on his restoration to health. To resist Sennacherib he made an alliance with Egypt for the sake of the cavalry possessed by that power (or so it was alleged by Sennacherib's emissaries). It was during this war that the Assyrian host was destroyed by a mysterious pestilence. Hezekiah also executed many public works, among them aqueducts at Jerusalem, and died at the age of 54, after a reign of 29 years.

Hibernation, the term used to denote the intermittent or continuous winter sleep of some animals in arctic, sub-arctic, and temperate regions.

Estivation is applied to the summer sleep of some intertropical animals, *e.g.* of the tanrec (q.v.), which indulges in a three months' nap in the hottest weather.

No bird hibernates, and this fact probably led to the somewhat hasty conclusion that hibernation was Nature's substitute for migration; but not only do some mammals migrate, but hibernation occurs in groups where migration also takes place—among the rodents, and the bats, with powers of flight almost equal to those of birds are among true hibernators. The phenomenon seems to depend chiefly on two factors: the failure of the food supply and low temperature. But since these are not sufficient to account for all cases of hibernation, some other factor or factors must be sought before the true explanation can be arrived at.

That the failure of food supply in winter has a great deal to do with the matter is shown by the fact that a series of examples among the rodents can be cited ranging from the food-storing habits of the long-tailed field-mouse (*Mus sylvaticus*), which does not hibernate, through the squirrel (*Sciurus vulgaris*), which hoards and hibernates partially, coming out of its hibernaculum, or winter quarters, frequently when there is a break in the cold weather, and the dormouse (*Myoxus arvenarius*), which also hoards, and sometimes wakes up, only to go to sleep again directly after a hearty meal, to the true marmots, which do not lay up a store of food, but retire to their burrows on the approach of winter and sleep till the return of spring. The badger and the hedgehog also hibernate. Bears are among true hibernators; many of them indulge in a prolonged winter sleep, but none lays up a store of food. According to Sir John Richardson, no bear retires to its den for the winter till it is fat, and, though it comes abroad in good condition in the spring, in a few days it loses the fat, and becomes quite lean. The Polar bear does not hibernate, but females with young retire to a den or cave and remain there from the end of November till about the end of March, when they come forth with their cubs.

In some of the lower vertebrates and in some invertebrates there is a lowering of vitality resulting in a kind of torpor in cold weather. This occurs in reptiles, amphibians, and many fishes, and some aquatic molluscs in winter bury themselves in the mud, emerging therefrom in the spring.

Hibiscus, a large genus of exotic Malvaceæ, most tropical trees or shrubs. Their flowers are large and showy, borne singular, each having an epicalyx of many leaves, five united and persistent sepals, five petals united at the base to the staminal tube, and five many-seeded carpels with distinct styles. *H. cannabinus*, Indian hemp or bastard jute, yields a useful fibre, and resembles hemp in foliage and mode of growth. Its petals are pale yellow with a purple blotch at the base. *H. rosa-sinensis*, a tree with large, variously-coloured flowers, has an astringent purple-black juice in its petals, used as a hair-dye in China and as blacking in Java. It is a greenhouse favourite; as also is *H. syriacus*, a shrubby autumn-flowering species

commonly known as *Althaea frutex*. The Gombo (*Abelmoschus* or *Hibiscus esculentus*), with edible fruits, is closely allied.

Hiccough is produced by involuntary contraction of the diaphragm accompanied by spasm of the glottis. A series of contractions usually occur at short intervals each accompanied by a characteristic sound, due to the closure of the glottis, and after the lapse of a few minutes the attack of hiccough comes to an end; if it is more persistent it may usually be checked by repeating the act of swallowing several times in succession, or even by holding the breath in some cases. In some forms of disease obstinate hiccough occurs; this condition is fortunately a rare one, as it is most distressing and but little can be done to relieve it.

Hickory (*Carya*), a genus of trees, comprising about a dozen species, belonging to the walnut family and native to North America. They differ from the true walnuts in their male catkins being borne three together; in each flower having not more than six stamens; in the female flowers having no corolla, and a sessile four-lobed stigma; and in the outer part of the fruit splitting regularly into four valves. The hickories reach a large size and yield coarse-grained, strong, heavy and very elastic timber, largely used for barrel-hoops, whip-handles, axe-handles, chair-backs, musket-stocks and fuel, but not very durable. *C. alba*, the shell-bark or scaly-bark hickory, yields the best timber and the edible nuts known as hickory-nuts. *C. oliviformis* is the source of the much superior Peccan nut, but even this is not equal in flavour to a walnut.

Hicks, SIR BAPTIST, BART., created Baron Hicks and Viscount Campden in 1628, was born in 1551. Through his connection with the Court under Elizabeth, James I., and Charles I., he prospered exceedingly, combining mercery with money-lending. He built at his own charge the old Clerkenwell Sessions House, long known as Hicks' Hall, and through his daughter's marriage became an ancestor of many existing peers, *e.g.* the Dukes of Devonshire, Beaufort, Portland, and Rutland, the Marquis of Northampton, the Earls of Gainsborough and Essex, and Lord Byron. He died in 1621.

Hicks, ELIAS, was born in Long Island, U.S.A., in 1748, and brought up as a carpenter. Under the influence of strong religious convictions he joined the Society of Friends, becoming an eloquent preacher and able organiser. Towards the end of his life he adopted independent views as to the Divinity of Christ, and founded a new sect called the Hicksites, dying in 1830. Hicks was one of the earliest opponents of slavery, and refused to use any products of slave labour.

Hicks, WILLIAM, COLONEL, known as HICKS PASHA, was born in 1830, and entered the Bombay army at the age of nineteen. After active service in Beloochistan, the Punjaub, Rohilcund, and under Lord Clyde during the Mutiny, he took part in the Abyssinian campaign of 1867-68. Baker Pasha selected him as chief of the staff in 1883, when

organising an expedition against the Mahdi. In September of that year he set out with 10,000 men on his march from Om-Durmah to El Obeid, but the column was surrounded and utterly destroyed in the desert through the treachery of native guides about November 3-4. A few of the survivors were taken by the Mahdi to Khartoum, but Colonel Hicks perished on the field.

Hidatsa, a North American people, variously known at Minetarees, Gros Ventres, Paunch and Fall Indians, who formerly roamed the steppe region between the Upper Missouri and the South Saskatchewan rivers, but who are at present confined to a reservation about Fort Berthold, North Dakota. The Hidatsas appear to be remotely allied to the Dakotas, and their language is regarded as a distant member of the Dakota stock language; but much uncertainty prevails regarding their relations to the other prairie Indians. (W. Washington Matthews, *United States Geological Survey, Miscellaneous Publications*, 1877.)

Hierapolis, a name given by the Greeks to many cities, of which the most important were:

1. Hierapolis in Syria Cyrrhestica, 16 miles from the junction of the Euphrates and the Sajur, and not far from Carchemish, with which it seems to have been confounded by early writers. Its first name was Bambyg, Mambug, or Mambe (in Greek *Bambyke*). We know nothing certain of the city's history until the Seleucid dynasty, when as Bambyce it grew populous and wealthy, deriving its appellation Hierapolis from the worship of the Syrian goddess Atargatis (Gr. "Derceto"). Crassus plundered it in 53 B.C., and under the emperors up to the time of Julian it was a strong and prosperous community. It then declined, and, though restored by Haroun-al-Raschid, it never recovered its former greatness. As Bayuk Mambedj, or Kara Bambuche, the ruins still exist, and have been carefully surveyed by modern explorers.

2. Hierapolis in Phrygia, at the confluence of the Lycus and the Meander, was celebrated in antiquity for its hot springs, used for dyeing as well as bathing and drinking. Epictetus was born here, and St. Paul (Coloss. iv. 13) founded a church. Kalessi Pambuk, or "Cotton Castle," is the Turkish designation of the locality, which preserves many perfect specimens of Greek architecture.

Hiero I. succeeded his brother Gelon as King of Syracuse in 478 B.C. He played an important part in the colonising of Sicily and Italy with Greeks, and by a great naval victory in 474 destroyed the maritime power of the Etruscans. In spite of his avarice and cruelty, he was a patron of the arts, and a personal friend of Æschylus, Simonides, and Pindar. He died in 467.

Hiero II., illegitimate son of Hierocles, a descendant of Gelon, on account of his military talents displayed against the Mamertines was elected King of Syracuse (270 B.C.). The Romans having espoused the cause of his enemies, he joined Hanno, the Carthaginian invader; but, having been defeated by Appius Claudius, came to terms on

condition that he should rule over the south-eastern part of the island. Henceforward he was a staunch ally of the Republic during both the first and second Punic Wars. He died in 216.

Hieroglyphics (Greek, "sacred sculptures"), the name given to the picture-writing in use amongst the ancient Egyptians. The objects depicted include human beings, birds, beasts, and fishes, the heavenly bodies, natural objects of all kinds, and articles of domestic use. There were various methods of hieroglyphic writing, but most frequently the signs were either cut out or carved in relief on stone or some other hard surface, or else drawn in outline on papyri with a reed pen. The hieroglyphs on monuments were often ornamented with colour. Those on papyri were written in black ink, a red mineral ink being employed for the rubrics and initial words. They were arranged either in horizontal or perpendicular rows, between which there were lines of black ink. The hieroglyphs were of two kinds—*ideographs*, which denoted the objects they portrayed or abstract notions which they would readily suggest, and *phonetics*, representing certain sounds. The phonetics were either alphabetic, ending in a vowel, or syllabic, ending in a consonant. A large collection of alphabetic signs is furnished by the earliest inscriptions which have been discovered, dating from 3800 B.C. An ideograph called a *determinative* is attached to the end of each word, generalising the conception, which is more precisely represented in the preceding phonetics. The language in which the hieroglyphs are written survived, with considerable modifications, in the form of Coptic, which was still spoken in Egypt in the 18th century. It belongs to the Hamitic group, but a Semitic element appears to have been introduced about 1400 B.C. The ancient Egyptian literature is treated under the heading HERMETIC BOOKS (q.v.).

The secret of hieroglyphic writing was jealously guarded by the priests, and the knowledge of Herodotus and other early writers concerning Egyptian mysteries was confined to such facts as they chose to communicate. When Egypt became a part of the Macedonian Empire a summary of the historic events recorded in the inscriptions and MSS. was drawn up in writing, and during the reign of Augustus the Romans seem to have been furnished with the means of deciphering them for themselves, but the Egyptian monuments did not excite their curiosity to any great extent. The *Stromata* of Clemens Alexandrinus (211 A.D.) is the earliest work which gives any precise information as to the nature of hieroglyphic writing. He was followed by Porphyry in 304 A.D., but from the 6th to the 17th century the study of hieroglyphics fell completely into neglect. It was revived in 1650 by Athanasius Kircher; but, as the symbols were supposed to be exclusively ideographic, no progress was made until 1787, when Zoega discovered that some of them had a phonetic value. The discovery of the Rosetta Stone (1799), with a trilingual inscription in hieroglyphics, in Semitic writing (the cursive or popular form of expressing

the hieroglyphs), and in Greek, all recording the same fact, enabled scholars to pursue their investigations on more systematic lines. The phonetic theory was carried further by Young in 1818, and the subsequent researches of Champollion, Lepsius, Bunsen, Brugsch, and other students have resulted in the detailed knowledge of the subject which exists at the present time.

It is the opinion of some scholars that the Phœnician alphabet, which was passed on by them to the Greeks and other western nations, was derived from the Egyptian hieroglyphs, but this theory has not by any means been firmly established.

The Aztec mode of picture-writing differed from the Egyptian in being mainly pictorial, but a phonetic system had been to some extent developed before the Spanish conquest. The inhabitants of Central America also had a symbolic method of writing peculiar to themselves.

Hierro or FERRO, one of the Canary Islands. Longitude is reckoned from it by some geographers. The chief town is Valverde.

Higgins, JOHN, a divine who flourished in the latter half of the 16th century at Winsham in Somersetshire. He produced an edition of Terence, a treatise on *Christ's Descent into Hell*, and a reprint, with additions of his own, of Sackville's *Mirror for Magistrates*. He died in 1603.

Higgins, MATTHEW JAMES, who wrote under the name of "Jacob Omnium," was born at Benown Castle, County Meath, in 1810, and educated at Eton and Oxford. He spent his early manhood in travel, visiting the West Indies and most parts of Europe, and it was not until 1847 that he came into prominence in connection with the relief of the Irish famine in 1847, when he tried unsuccessfully to enter Parliament. From 1848 to 1854 he took an active interest in the *Morning Chronicle*, then the organ of the Peelites. He next associated himself with the *Times*, and his letters signed "J.O.," "Paterfamilias," "A Belgravian Mother," etc. etc., appeared in that paper until 1863. He sent contributions later to the *Pall Mall Gazette*, though many of his longer articles appeared in the reviews and magazines, especially the *Cornhill*, whilst under the direction of his intimate friend Thackeray. Mr. Higgins, who was a Catholic, married a daughter of Sir A. J. Tichborne, and died in 1868.

Higginson, THOMAS WENTWORTH, born at Cambridge, Massachusetts, U.S.A., in 1823, and educated for the ministry at Harvard, abandoned the pulpit for politics in 1858. An ardent abolitionist, he became during the War of Secession colonel of the first coloured regiment raised by the Federals. He was severely wounded in 1863, and left the service to devote himself to literature, acting from 1881 to 1884 on the State Board of Education. Many of his books are in support of the rights of women, but his larger and smaller *History of the United States*, his *Translation of Epictetus*, and his *Army Life in a Black Regiment*, possess wide interest.

Highgate, a parish and suburb in the north of London and the county of Middlesex, is said to derive its name from a toll-bar erected where the great north road passed through the Bishop of London's park. The village stands on a hill 426 feet high, at the base of which may be seen the Whittington Stone, renewed in 1821, and the almshouses founded by the famous Lord Mayor. Many fine mansions were built here in the 16th and 17th centuries, few now remaining. Lauderdale House still exists in the park which Sir Sydney Waterlow has dedicated to public use. The church of St. Michael, rebuilt in 1832, contains a monument to Coleridge, who lived here for many years. The grammar school, founded by Chief Justice Cholmeley in Queen Elizabeth's reign, was reconstructed in 1868. Lower down the hill is St. Joseph's Retreat, a spacious Roman Catholic institution of recent date. The North London Cemetery close by contains the graves of many eminent personages. The Horns tavern used in former days to be the resort of merry-makers, who went through the mock solemnity of being sworn on the horns. Among other celebrities connected with the place are Lord Lyndhurst, Michael Faraday, and Baroness Burdett-Coutts.

Highlands, THE, a term used somewhat vaguely to designate the mountainous portion of Scotland lying N. of an imaginary line beginning at Nairn on the Moray Firth, running S.E. to the Dee at Dinnet, thence S. to the West Water in Forfarshire, and ending at Ardmore on the Clyde, the whole of Argyleshire and the islands, except Arran, being included in the division N. of the line. The Lowlands, of course, are the districts south of this ill-defined boundary. The use of the Gaelic language and the ethnological characteristics of the native population roughly serve to mark off one division from the other. A very distinct geographical feature, viz. the chain of lakes connected by the Caledonian Canal, separates the Northern from the Southern Highlands, whilst a less clear boundary limits the area popularly known as the Western Highlands.

High Ordnance. [ORDNANCE.]

Highwaymen, robbers who attack and pillage persons passing along the highway. The most renowned English highwaymen were Claude Duval (1643-70), Dick Turpin (1705-39), and Swift Nick Nevison, hanged at York in 1684. Out of a story concerning Nevison grew the legend of Dick Turpin's ride to York.

Hilary, ST., "of Arles," was born about 401 on the borders of Lorraine. He succeeded his kinsman St. Honoratus as Bishop of Arles and Metropolitan of Vienne and Narbonne. In this latter capacity he deposed Chelidonius, Bishop of Besançon, against the orders of Pope Leo I., who deprived him of his functions. a sentence confirmed by the memorable edict of Valentinian III. He continued, however, to exercise the duties of his see until his death in 442. Besides his reputation for austere piety and devotion to the Gallican Church, he enjoyed some fame as an author, his extant *Life of*

St. Honoratus and *Metrical Version of the First Chapters of Genesis* showing considerable literary power. In the Roman Calendar his day is kept on May 5. Some writers consider him to have been the author of the so-called Athanasian Creed.

Hilary, ST., "of Poitiers," known as "the Athanasius of the West," and "Malleus Arianorum," was born at Poitiers about 300. A pagan and a married man, he embraced Christianity somewhat late in life, and was made bishop of his native town in 350, continuing to live with his wife. He stood forth as one of the staunchest opponents of Arian doctrines, then supported by the Emperor Constantius, and, having addressed an epistle to that sovereign, was by him banished into Phrygia. He returned in 360 after composing in exile his famous treatises. *De Synodis*, *De Fide Orientalium*, and *De Trinitate*, and after personally visiting the Emperor at Constantinople. His later years were devoted to the task of commenting on the Psalms, the Gospel of St. Matthew, and the Book of Job. He died on January 13, A.D. 368, and his name is perpetuated in *Hilary Term*, though that begins on January 11, three days before the date with which his name is associated in the Roman Calendar. The *Te Deum Laudamus* is occasionally attributed to him.

Hilda, ST., or HILD, daughter of Herreric, nephew of Edwin, King of Northumbria, was born about 614, and was baptised at the age of 14 by Paulinus. During the pagan period that followed, Edwin and she were sent to Paris, but being recalled by Bishop Aidan of Iona she became a nun, and was appointed in 649 Abbess of Hartlepool (Heortea), and ten years later founded the famous convent at Whitby for monks as well as nuns, ruling this mixed community with rare ability and vigour. She died in 680, leaving behind her a saintly reputation, which still clings to her memory.

Hildesheim, an ancient town on the river Innerste in Hanover, North Germany, 18 miles S.E. of the capital of the province. It is a quaint old place, with narrow streets overhanging wooden houses of the mediæval type, and many fine churches, such as the Catholic cathedral (founded in 818, and actually built two hundred years later), St. Godehard's, a Romanesque structure of about the same date, St. Michael's, and St. Magdalene's, containing relics of Bishop Bernward, with several others of the Protestant cult. There are also a town hall of the 15th century, the Georgstift, a retreat for the daughters of state officials, and a number of other public institutions. Hildesheim does not come into historical prominence until 822, when it became the seat of a bishopric, which maintained independence for nearly 1,000 years. The industries are linen-weaving, lacquer-making, distilling, carriage-building, etc. In 1868 a remarkable treasure of silver-plate of the Augustan period, supposed to have belonged to Drusus, was dug up on a neighbouring hillside.

Hill, AARON, was born in London in 1685. At the age of fifteen joined his kinsman, Lord Paget,

then ambassador at Constantinople, under whose auspices he saw all the eastern shores of the Mediterranean. Coming home in 1709 he wrote a *History of the Ottoman Empire* and a poem entitled *Camillus*, in praise of Lord Peterborough. He soon afterwards became manager of Drury Lane, moving afterwards to the Haymarket opera-house. Before he lost these posts through his own folly, he wrote 17 dramas, of which *Elfrid* or *the Fair Inconstant*, *Zara*, and *Merope*, were the most successful. He also composed the libretto of *Rinaldo* for Handel. Pope gave him a place in the *Dunciad*, and was sharply attacked in return. Dying about 1750, he found a grave in Westminster Abbey.

Hill, REV. ROWLAND, was born in 1744, being the third son of Sir Rowland Hill, Bart., the head of an old Shropshire family. As an undergraduate he began to roam about the country and preach to the poor, associating himself with Berridge and Whitfield. In 1774 he was ordained, and held for a time the cure of Kingston, Somerset, but the routine of the Establishment was irksome to him, and, though never dissociating himself from the Church, he struck out an independent line, came to London, and in 1784 opened an unlicensed place of worship—the Surrey Chapel. Here for nearly fifty years he worked on in his own eccentric way. He was, moreover, an ardent supporter of the Sunday School movement, of the London Missionary Society, the Bible Society, and the Tract Society, and he wrote a volume of *Hymns* that still has a hold on popular affection, besides several controversial books of less merit. So great faith had he in the newly-invented practice of vaccination that he operated on no fewer than 40,000 persons. His death occurred in 1833.

Hill, SIR ROWLAND, K.C.B., born at Kidderminster in 1795, and in 1825 settled at Bruce Castle, Tottenham, as a schoolmaster, but soon abandoned that career on the score of ill-health. For a few years he was secretary to an association for colonising South Australia. Accidentally his attention was drawn to postal organisation, and in 1837 he published a pamphlet entitled *Post Office Reform*, in which he advocated penny postage and the use of stamps. His propositions were scouted by the officials, as might have been expected, but fortunately they took with the public; agitation ensued, Parliament was appealed to, and in 1840 this great measure was carried. Hill was appointed to a place in the Treasury, in order to advise on the new organisation, but the Peel Ministry cast him adrift two years later, a step that aroused general indignation and brought Hill a handsome public testimonial of £13,000. He became for a brief period chairman of the London and Brighton Railway, introducing the system of cheap excursions. In 1846 the Liberal Government gave him the secretaryship to the Postmaster-General, and he ultimately became Chief Secretary. He retired in 1864, receiving a pension of £2,000 a year and a grant of £20,000. He was a namesake but not a kinsman of Rowland Hill the preacher.

Hillel, HAZZAKEN, or "the Elder," a Jewish

rabbi of Davidic stock, was born at Babylon, probably about 75 B.C., though some traditions fix the date as 112. His zeal for the study of the law was so strong that he made his way to Jerusalem, and, whilst working as a day-labourer, contrived to attend the Beth-Midrash, and ultimately rose to be president of the Sanhedrim with the title of Nasi or prince. To him are ascribed the seven Middoth, or rules of interpretation, and the Prosbol, in both of which he endeavoured to adapt the stiff precepts of Judaism to the needs of progressive society. He is identified by some with the Pollion of Josephus, and is said to have been the grandfather of Gamaliel I. Our only authority, however, for the meagre outline of his career is the Talmud. He died about 10 A.D.

Hiller, FERDINAND VON, was born at Frankfurt of Jewish parents in 1811, and, showing an early aptitude for music, was put under the tuition of Hummel at Weimar. After spending seven or eight years in Paris, he went to Italy in 1836, and composed his first great work, an oratorio entitled *The Destruction of Jerusalem*. On his return to Germany in 1840 he produced two operas, *A Christmas Night's Dream* and *Conradin*. Among his many works, all examples of the classical style, may be mentioned *Saul*, an oratorio, the *Spring Symphony in E*, *Nala and Damajanti*, a cantata composed for the Birmingham Festival of 1871, and a volume of songs. He wrote well and copiously on musical subjects, his *Reminiscences and Letters of Mendelssohn*, *Records of Modern Musical Life*, *Goethe as a Musician*, and *An Artist's Life* being admirable contributions to this branch of literature. He died in 1885.

Hill Forts, in a specific sense, are the strongholds of the primitive inhabitants of various European countries, many of which are of prehistoric origin. They are usually more or less circular, the precise form of the fort or forts being determined in each case by the nature of the ground. Sometimes, when surrounding hills afforded sufficient protection, the fort itself was not placed on a summit but in a lower position, affording readier access to the neighbouring meadows and pastures. Often a line of forts was made, enclosing the whole of the upper part of a hill, which thus became a little citadel or town; in fact the name of *oppida* was given by the Romans to the fortresses which they found in Gaul. In some countries, as for example England, earthworks are commoner than stoneworks; in Wales, on the other hand, stone is the usual material. The Gallic forts were built of dry-stone masonry, strengthened by the insertion of thick logs of wood, and the same method of construction was employed at Buryhead in the north of Scotland—a country in which hill forts or "dunes" (q.v.) are exceedingly common. The largest fort in England is that at Cissbury in Sussex, which extends over 60 acres. In Ireland there are large stone forts on the Isles of Arran and elsewhere. Of the vitrefaction observable on the surface of the walls in France, Scotland, Ireland, Hungary, and elsewhere no satisfactory explanation has as yet been given.

Himālāya (Sans. "snow-abode" or "snow-mountain"), the name popularly given in various parts of India to the peaks visible upon the northern horizon, and adopted by geographers to designate the entire system of mountains that in length stretches from the Brahmaputra to the Indus (1,500 miles), and in breadth embraces the watersheds of those rivers and of their chief tributaries, extending over 150 miles. The name is only a convenient appellation for that part of the fringe of the great Tibetan tableland which abuts upon Hindostan. That plateau has an average elevation of 15,000 feet, whilst the plains of Northern India seldom attain 1,000 feet above sea-level. The course of the rivers plainly shows that the vast chain of the Himalayas is but a corrugation, so to speak, upon the still vaster slope which trends from the sea to the Central Asiatic plateau. The ridge has power to check the southward flow of the Indus and Brahmaputra, but not to turn them back, and here and there streams, as the Sutlej, actually break through the barrier, though the passes average a height of 18,000 to 20,000 feet, whilst the dominant peaks such as Mount Everest (Nepal), the highest point yet measured on the earth's surface, Kinchinjunga (Sikkim), and Dhawalagiri (Nepal), attain 29,002, 28,156, and 26,826 feet respectively, and many summits exceed 25,000 feet. As yet geological observations have been too incomplete to throw much light on the structure of these mountains. The outer ranges known as the Siwaliks or sub-Himalayas are of recent formation, the fossils pointing to the Miocene or Pliocene period, but these strata are close to nummulitic beds of distinctly marine origin, and on reaching the flanks of the higher peaks fossils disappear and the rocks assume a metamorphic character—greenstones, slates, schists, and conglomerates being intermingled freely. Granitic intrusions occur here and there, and permeate as veins the highly crystalline gneiss or schistose rocks of which the summits are built up. Geologists are of opinion that the existence of the range is not due to any violent upheaval, but that the elevation is recent and attributable to the cooling and contraction of the earth's crust. Glaciers of vast area are abundant, but, as they do not descend to so low a level as in Europe, they were long supposed to be non-existent. The rainfall, especially on the outer ranges and in the eastern quarter, is very heavy between May and October, but diminishes on the higher levels and sinks to an inappreciable amount in Tibet.

Himyarites, a historic people of South Arabia, whose domain included the present Yemen (Arabia Felix) and the Hadramaut coastlands eastwards to Oman. The name in its Greek form *Homeritæ* occurs first in Pliny and Ptolemy, both of whom describe them as closely related to the Sabæans, who are placed in the same region. Later the latter term fell into disuse, while Himyar, that is *Ahmar* ("red"), was adopted by the early Christian and Arab writers, as the general designation of all the peoples of South Arabia, who in pre-Mohammedan times spoke a Semitic language distinct from and

of a more archaic type than the Arabic. The Himyarites and Sabæans were, in fact, mere branches of the same Semitic race, which probably had its origin in the south-west Arabian uplands, and spread thence, long before the dawn of history, across the Red Sea, possibly so named from them, into Abyssinia. At a still more remote epoch they migrated northwards through Arabia into Phœnicia, Canaan, Syria, and Mesopotamia, which regions constitute the original domain of the Semitic family. That the Himyarites were the original stock and Arabia Felix the cradle of the Semites, seems probable from the fact that their language, still preserved as the liturgical language of the Abyssinian Christians [GEEZ], is by far the most primitive of all the Semitic tongues. [EHKILE.] The genealogies of the Himyarites given by Ibn Khaldun in his *History of the Berbers* are fanciful, but they serve to show how far the Arabs proper regarded the primitive inhabitants of Yemen as their kinsmen. They are traced in these tables, through Himyar, grandson of Kahtan [YECTAN] to the Heber of Genesis x. 24, and are described as the oldest and purest branch of the race, hence called *Arab el-Aribah*, "Arabs of the Arabs." With the spread of Islam they adopted the language of the Koran—that is, of the Koreish Arabs; and their descendants, the present inhabitants of Yemen, are no longer pure Arabs, but much mixed with black blood through the female slaves imported from Africa during the Mohammedan period. (J. H. Mordtmann and D. H. Müller, *Sabäische Denkmäler*, Vienna, 1881; *Lay of the Himyarites*, edited by W. F. Prideaux, 1880.)

Himyaritic Languages. [HIMYARITES.]

Hincmar, ARCHBISHOP, born of noble Frankish blood about 806, was educated for the priesthood at St. Denis, of which foundation he became canon, acquiring also considerable influence at the courts of Louis the Pious and Charles the Bald, until in 845 he was elevated to the see of Rheims on the deposition of Ebo. The Pope confirmed his election, but when he proceeded to depose some of the clergy ordained by his rival, especially the Bishop of Soissons, Pope Nicholas I. interfered, and the Isidorian decretals were issued, materially advancing the authority of Rome; but the archbishop subsequently, in defiance of Adrian II. and the Emperor, crowned Charles as King of Lorraine, and severely punished the rebellion of his nephew, the Bishop of Laon. Many years of his life, which ended at Epernay in 882, were spent in a controversy with Gottschalk (q.v.) on predestination, and he wrote on this subject several treatises with the aid of John Scotus Erigena.

Hind, the female of the Stag (q.v.), especially after its second year. The term is sometimes used for the females of Asiatic deer, and even for female Antelopes.

Hind, JOHN RUSSELL, F.R.S., was born at Nottingham in 1823, and at the age of seventeen, abandoning civil engineering, for which he was destined, took a post as assistant in the Greenwich Observatory, and in 1844 was employed in the

important duty of measuring the astronomical difference of longitude between Greenwich and Valentia, Ireland. Professor Airy induced him next year to become superintendent of Mr. Bishop's Observatory in the Regent's Park. Among his works, most of them written in a popular style, are *The Solar System, An Astronomical Vocabulary, The Illustrated London Astronomy*, and *A Descriptive Treatise on Comets*. He has, moreover, edited since 1853 the *Nautical Almanac*.

Hindu, properly the collective name of the Indian branch of the Aryan peoples, who entered the peninsula from the north-west and consequently formed their first settlements on the banks of the Indus (Sindhu, Hindhu); but the term is not of native origin, and only came into general use during the Mohammedan epoch through Persian influence, as shown by the change of *S* to *H*, a phonetic process characteristic not of the Indic, but of the Iranic, as also of the Hellenic branch of the Aryan languages. Even now the term *Hindu*, as well as *Hindustan* ("Hindu Land"), is used chiefly by the Mohammedans, and by them restricted to the region roughly corresponding to the British administrative division known as the "North-West Provinces;" but it is now applied by European writers in a general way to all the inhabitants of India, and in a religious sense to those professing the Brahmanic as opposed to the Buddhist religion.

Hindu Kush is the name given to a range, or rather group, of lofty mountains towards which the Himalayan and Thian Shan systems converge, it being more closely connected with the latter than the former. Striking off from the S.W. angle of the Pamir plateau, this huge watershed extends W. for 365 miles to the Bamian Valley in Afghanistan, where the triple peak of Koh-i-Baba (16,500 feet) ends its course. From N. to S. the subsidiary ridges spread, perhaps over 200 miles. Towards the E. the passes are easy, but in the central and W. portion they average from 12,000 to 15,000 feet, and some of the peaks—*e.g.* Hindu Koh and Tirich Mir—are estimated at more than 20,000 feet. Geographers divide this mass into the Chitral, the Kafistan, and the Panjhir sections, according to the valley basins into which the slopes drain; but this arrangement is somewhat arbitrary. Roughly speaking, the whole range separates the basin of the Cabul river from that of the Oxus, and Afghanistan proper from Turkestan. Geologically the Hindu Kush seems to consist mainly of mica slate, gneiss, and schist, with veins and cappings of granite on the higher levels. Limestone is not infrequently met with, and is generally burrowed by extensive caves. Minerals of all kinds are abundant, especially iron, but no fuel is known to exist.

Hindustani, a Neo-Sanskritic language which is based on the Hindi vernacular of the Doāb (the region between the Ganges and Jumna rivers). Here it took its present form in the 16th century in the camps of the Moghul conquerors, and hence its native name *Urdū Zabān* ("camp language"). In its structure it is essentially Indic, though the synthetic Sanskrit forms are mostly replaced by

analytic constructions, and in this respect it is the most advanced of all Sanskritic tongues. In its vocabulary it is, like English, a composite language, the three chief elements being Sanskrit, Persian, and Arabic, the two latter increasing or diminishing according as it is spoken or written by Mohammedans or Hindus. It is also written in three different characters: Devanāgarī by the Hindus, the Persian form of the Arabic, with a few additional letters by the Mohammedans, and the Roman by the missionaries and other Europeans. The literature is copious, comprising histories, annals, tales, educational works, and much poetry, mostly translations, or based on Persian originals. Hindustani has always been more of a *lingua franca* than the language of any particular district, and as such is now current in almost every part of the peninsula, being spoken altogether by over 100,000,000, but by few exclusively. There are two distinct forms, the Northern, and the Southern, or Dakhni, spoken in the Deccan, which presents many peculiarities of structure due to the influence of the surrounding Dravidian languages.

Hinny, the offspring of a stallion and a she-ass. It is smaller, but more docile than the mule (q.v.). Some early Continental naturalists thought these animals were the hybrids between equine and bovine species. Some curious information on the subject will be found in Blumenbach's *Treatises* (edited by Bendyshe).

Hinton, JAMES, M.R.C.S., was born at Reading in 1822, being the son of a clergyman. He started on a business career at the age of sixteen, but soon abandoned it for surgery, and in 1847 took his diploma. After spending some years at sea and in Jamaica, he settled down in London as a specialist, devoting his exclusive attention to diseases of the ear. He speedily rose to the top of the profession in this department. His real bent, however, was towards metaphysics and psychology, upon which he brought to bear much originality and earnestness. Finally he developed a kind of scientific mysticism which can be traced in his various works: *Man and His Dwelling-Place, Life in Nature, Thoughts on Health*, and *The Mystery of Pain*. He died in 1875. Miss Ellice Hopkins has written a *Life*.

Hip. The hip joint is a typical ball-and-socket joint. The socket of the joint is formed by a depression which exists on each side of the outer aspect of the pelvis, and is called the *acetabulum*: in this depression the rounded head of the femur or thigh-bone rests, being retained in its place by a series of ligaments, one of which, the capsular ligament, is attached, on the one hand, around the edge of the acetabulum, and, on the other, to the neck of the femur just beyond its head, enveloping the latter and limiting the extent of the joint cavity. The movements at the hip joint are very free. The joint is deeply situated, and thus escapes many forms of disease which affect more superficially situated joints. The principal affections to which it is subject are as follows:—

Dislocation of the hip may occur in four different

directions. The most common form is dislocation of the head of the femur upwards and backwards. The symptoms are distortion, inability to move the joint, the limb is shortened, and the head of the femur can generally be made out in its displaced position. Treatment consists in reducing the dislocation and keeping the patient in the recumbent position until such time has elapsed as will allow of the repair of the injured parts.

Diseases of the Hip. The hip is not uncommonly affected by the disease known as *osteo-arthritis*. The joint is, as might be expected, often involved in fractures of the neck of the femur. The most important diseased condition affecting the hip, however—"hip disease" *par excellence*—is what is known as strumous disease of the hip joint. This malady particularly affects children and young adults. The chief symptoms are pain (which, curiously enough, is sometimes felt in the knee joint, although it is the hip and not the knee which is at fault), lameness, a distorted position of the leg with respect to the body, and limitation of the power of moving the joint, the muscles of the affected limb waste, and when the disease becomes established collections of matter occur in the neighbourhood of the joint. Early treatment of the disease is most imperatively called for, as, if abscesses are allowed to form, pent-up matter burrows deeply into the tissues, causing much damage and disorganisation before it makes its way to the surface. In neglected cases of hip disease amyloid degeneration of the liver, spleen, and kidneys is apt to supervene; tubercular meningitis, and tubercular disease affecting other parts of the body may occur as complications. Treatment consists in keeping the patient absolutely at rest in the recumbent posture, splints are applied to the legs, and an attempt is made to gradually correct the deformed position of the affected limb by the application of what is called *extension*. A weight is adjusted by means of a pulley so as to continually exert tension in the appropriate direction upon the limb which is involved, and this process of extension requires, as a rule, to be kept up for some months. If collections of matter form, the pus must be evacuated under suitable antiseptic precautions, and in some instances of advanced hip disease it is deemed necessary either to remove the diseased tissues (excision of the hip joint) or to amputate the limb.

Hipparchus. 1. A native of Nicæa in Bithynia, flourished from 160 to 125 B.C. He was the first to apply strict mathematical methods to astronomy, and he probably made the catalogue of 1,080 stars preserved by Ptolemy. Only one of his works is extant, viz. *A Commentary on the Phenomena of Aratus and Eudoxus*.

2. Son of Pisistratus, Tyrant of Athens, who inherited supreme power jointly with his brother Hippias in 527 B.C. Though he seems to have been an enlightened ruler, and a patron of art and letters, he was assassinated in 514 by Harmodius and Aristogeiton (q.v.). His brother retained authority till 511, but displayed in these latter years a cruel and suspicious temper. On being expelled, he betook himself to the court of Darius, and is said to have

acted as guide to the Persians in their invasion of Greece, perishing at the battle of Marathon in 490.

Hippocampus (SEA HORSE), a genus of Lophobranch fishes of the family Syngnathidæ, with about twenty species widely distributed, especially in tropical and subtropical seas. They are of small size, and the front part of the body presents a strange resemblance to that of a horse, and ends in front in a snout, and behind in a prehensile tail, which in the males has a sac at its base, in which they carry the eggs. Pectoral fins and a soft dorsal are present. *H. antiquorum*, common in the Mediterranean, is sometimes taken on our coasts. The three species of the allied genus Phyllopteryx, from Australia, are about a foot long. There is no pouch, but the eggs are embedded in the soft membrane near the tail. The body is covered with filaments so as to resemble floating weed. [FISHES, vol. iv. p. 305.]

Hippocrates, "the Father of Medicine," was born about 460 B.C. A descendant of Æsculapius, he belonged to the Asclepiadæ, and his father was a physician. Little is known of his life, which was spent partly in travel, partly in practice at Athens, where he won a high reputation. He died at Larissa, at the age of 85, according to some, others adding five-and-twenty years to this figure. No fewer than eighty-seven treatises are ascribed to him, but of these not more than twelve or thirteen are accepted as genuine. These latter deal with a variety of topics—*e.g.* prognostics, epidemics, regimen, public health and climate, fractures, injuries to the joints and head, etc. The most widely known of his works is *The Aphorisms*, but it is of doubtful authenticity and inferior to much of his work. He appears to have had an inkling of the method of diagnosis by auscultation, as is testified by the phrase "Hippocratic succussion" in use for many centuries. The *facies Hippocratica* is the expression worn by the features of a person immediately before death.

Hippodamia was, according to Greek legend, the daughter of Ænomaus, King of Pisa in Elis, by Asterope, one of the Pleiades. In obedience to an oracle her father promised her hand to anyone who could defeat him in a chariot race, death being the condition of failure. Several aspirants had met their fate when Pelops, a Lydian prince, appeared on the scene. He bribed Myrtilus, the king's charioteer, who caused his master to ride in a broken chariot. A disaster ensued which cost Ænomaus his life and made Hippodamia the bride of Pelops, to whom she bore Atreus and Thyestes.

Hippolytus. 1. The legendary son of Theseus and Hippolyte, who had the misfortune to win involuntarily the love of Phædra, his stepmother. As the youth's modesty was proof against her advances, she denounced him to her husband for the crime which he had refused to commit. Theseus drove his son forth, calling upon him the wrath of Neptune, who sent his sea-calves to frighten by their bellowing the horses of Hippolytus as he drove along the shore. He was thrown from his chariot and torn to pieces among the rocks, and

his story provided material for the *Hippolytus* of Euripides and the *Phèdre* of Racine.

2. A Greek Christian writer of the 3rd century, who appears to have lived and taught in Rome. He took part against Callistus in the controversies of the day, and under Alexander Severus is said to have been banished to Sardinia, dying there about 240. His most valuable work is entitled *Omnium Hæresium Refutatio*, and contains most interesting information as to the ante-Nicene controversies.

Hippopotamus, a genus of aquatic Artiodactyle Ungulates, constituting a family (Hippopotamidæ), ranging back to Miocene times, and having a representative (*H. major*) in the English Pliocene of even larger size than the common form. There



HIPPOPOTAMUS.

are but two living species—*H. amphibius*, the Common Hippopotamus or River-horse, till within recent times distributed over the greater part of Africa, where its range is becoming restricted, and *H. liberiensis*, the much smaller Liberian hippopotamus, confined to western tropical Africa. The latter is sometimes made a distinct genus (*Chæropsis*), from the fact that it has only two incisors in the lower jaw, the dental formula being $I_{\frac{1}{2}} C_{\frac{1}{2}} M_{\frac{6}{6}}$ or $\frac{7}{7}$. The family occupies a position between the swine and the deer, but is more closely related to the former than to the latter group. The lower canines are tusk-like, the stomach imperfectly divided, the body massive, and the limbs four-toed. There are two teats, inguinal in position. The Common Hippopotamus, supposed to be the "behemoth" of Job, is about 14 feet long and about 5 feet high at the shoulder. The head is thick and square, the muzzle large and tumid, and the ears and eyes small. The animal can close both nostrils and ears when under water, and the eyes are so high up that on rising to the surface it can command a wide

field of vision without exposing much of the head or body. The skin is very thick, hairless, and full of pores that exude a fatty secretion, and the tail is short. The general colour is a dark brown, but partial and entire albinism is recorded. These animals are generally found in herds in rivers and lagoons, sometimes in brackish estuaries. They feed during the day on water-plants, and at night come on shore, where they commit great havoc among the crops, especially of green corn. Although so clumsy-looking, they swim with ease, and move rapidly through the thickets when on shore. They appear to be inoffensive when left alone, but when roused or wounded they are dangerous foes. Instances are recorded of their biting a man literally in two, and Sir Samuel Baker tells how one charged a steamboat and pierced two of her iron plates with its tusks, "as if a sharp pick had been driven through them." The hippopotamus is hunted by the natives for its flesh (about the quality of which white men do not agree), its hide, and its ivory, which is specially valued by dentists. European hunters of "large game" have done their part in thinning the numbers and restricting the range of these animals, which render no little service by clearing the vegetation from the beds of streams and lakes, and so preventing the increase of marsh land in the Dark Continent.

Hippuric Acid is a compound, of composition $C_9H_9NO_3$, which occurs largely in the urine of herbivorous animals. It may be obtained from this source by adding lime, filtering, and, after concentrating the liquor obtained, adding hydrochloric acid, when hippuric acid is precipitated as a crystalline powder, soluble in hot water or alcohol. It is also found in human urine if certain aromatic substances be taken into the body. It may be prepared by numerous synthetic reactions, which show its constitution to be that of *benzoyl-glycine*—i.e. glycine (q.v.), one hydrogen of which is replaced by the radical benzoyl. [BENZENE.]

Hippuritidæ, an extinct family of Lamelli-branchiata (q.v.), which flourished during the Cretaceous period. They were allied to the Chamas or Clams; they had a high, almost tubular, right valve, which was attached to rocks, the sea floor, or other shells; they lived in colonies. The left or upper valve is a thin flat plate. Though very abundant in the chalk of France and the south of Europe, the type genus *Hippurites* has not yet been found in England.

Hiring, legally known as "bailment for hire," and in Scotland as "location," is in the nature of a contract to be performed for reward or compensation. There are four sorts of hiring, viz.:—1. The hiring of anything for use. 2. The hiring of work and labour. 3. The hiring of care and services to be performed or bestowed on a certain thing delivered. 4. The hiring of the carriage of goods from one place to another. The three last are subdivisions of the general head of hire of labour and services. The rights, duties, and obligations of the parties resulting from such a contract are too elaborate to be given here.

Hirudinea. [LEECH.]

Hissar. 1. A division, district, and town of the Punjab, in British India. The division includes the three districts of Hissar, Rohtak, and Sirsa, having an area of 8,355 square miles. It lies between Sirhind and Rajpootana, and, fringing the Bikaner deserts, is liable to droughts and famines. The district of Hissar, forming the central portion of the division, extends over 3,539 square miles. It exports large quantities of oil-seeds, grain, copper and brass ware, hides, saltpetre, and some cotton. The climate is very dry, and the soil, when irrigated, highly productive. The white cattle are famous throughout India. The Ghaggar is the only river, and the water-supply is derived chiefly from the West Jumna Canal. Hindus of the Bhatti tribe make up three-fourths of the population. Bhawani is the commercial centre, and is three times as large as Hissar, the seat of administration, or Hansi, the only other municipality.

2. A state in Central Asia, lying north of the river Oxus, and opposite to Balkh, in Afghanistan, between the desert to the west and the provinces of Karategin and Darwaz to the east. It is nominally, since 1870, under the government of the Khan of Bokhara, but the Russians explored its almost unknown recesses in 1875, and have since acquired an influence. One of the three roads, all difficult, by which it can be reached from Bokhara is through the renowned defile of Kohluga, said to have been once closed by a gate of iron. The Surkhab, Kafirnihan, Sarkhan, and Shirabad-Daria, tributaries of the Oxus, traverse the country, which, though extremely mountainous, is fertile in the valleys. Derbend, Shirabad, Baisun, and Hissar, the strategical capital, are the chief towns; and Kulab, in a district of its own, lies beyond the Sarkhan, which is spanned by the ancient stone bridge of Pul-i-sanghin. The inhabitants are mainly Uzbeks or Tajiks, under seven semi-dependent begs. Hissar, meaning "fort," is the name of many other Asiatic towns.

Histology is the science which treats of the minute anatomy and microscopic appearances of the tissues of animal bodies. The whole of the animal body is made up of cells, or the derivatives of cells, and great advances have been made within recent years in the study of the various modifications which cells undergo, and accurate knowledge of the way in which these cells are built up to form the several organs of the body has been obtained. [BLOOD, EPITHELIUM, CONNECTIVE TISSUES, MUSCLE, GLANDS, NERVE, ETC.]

Histology, VEGETABLE. is the study of the tissues of which all multicellular plants are composed. A *tissue* is an aggregate of cells or vessels obeying a common law of growth and, as a consequence, resembling one another. A *true tissue* is the result of cell-division; a *false tissue*, of the approximation of cells of independent origin. Tissues may be *merismatic* or *meristem*, when their cells retain their protoplasm and the consequent power of cell-division; or *permanent*, when they have lost this. Again, they may be *parenchymatous*, when their cells are not much elongated, when there are generally marked intercellular spaces; or they may be *prosenchymatous*, with

elongated elements. Thirdly, tissues may have the walls of their constituent cells *unthickened* or *thickened*, and in the latter case the term *sclerenchyma* is applied when the walls are hardened by a ligneous deposit, and *collenchyma* when the corners of cells are thickened mucilaginously. Of these *kinds of tissue*, the embryo and the growing points of stems or roots exhibit a meristem known as *primary*, or in the latter case as *apical*, from which at an early stage three or four primitive *tissue-systems*, the *dermatogen* or primitive epidermis, the *plerome*, or primitive vascular axis, the *periblem*, or primitive cortex, and in roots the *calyptragen*, or primitive root-cap, are commonly differentiated. In roots and stems, zones of tissue remaining merismatic until a late period are known as *secondary meristem*. Of this the *cambium-ring* of the exogenous stem, the *pericambium* of roots, and the *phellogen*, or cork-cambium, are examples.

Tissues may also be grouped under six *systems*. (1) The *fundamental* or *ground-tissue*, from which all the others have been differentiated and which remains as a sort of connective tissue between them, is permanently represented by the inner or *primary cortex*, the *hypoderm*, often collenchymatous, immediately below the epidermis, and the *endodermis* or bundle-sheath. (2) The *epidermal*, or *limitary system* is usually a single layer of somewhat flattened, colourless cells, with hairs and, on those parts exposed to air, stomata (q.v.) and sometimes excreting a waxy bloom or a separable outer thickening or *cuticle*. (3) The *fascicular* or *fibro-vascular system* originates in isolated merismatic strands of the *plerome* which are then known as *procambium*, and from this isolated origin its members are termed *bundles*. It forms the veins of leaves and, in the higher plants, the bulk of the stem. Each bundle consists of two groups of elements, *xylem*, or wood, and *phloem*, or bast, either exclusively, as in the *closed bundles* of leaf-veins or of the stems of monocotyledons; or with a zone of cambium between them, as in the *open bundles* of the exogenous stem. Xylem consists of three or four kinds of elements, viz. *vessels*, or cell-fusions with thickened walls; *tracheids*, or elongated vessel-like but unfused cells; *woody fibre*; and *wood-parenchyma*. Phloem consists of *sieve-tubes*, the protoplasm-containing vessels of the bast; *bast-fibres*, the long flexible elements that form the bulk of the whole phloem; and bast-parenchyma, including the elongated *cambiform-cells*. (4) The *medullary system* consists mainly of unthickened and often parenchymatous pith. (5) The *cortical system*, in addition to the *primary cortex*, originating directly from the periblem and often consisting of thin-walled parenchyma filled with starch, comprises the *phellogen*, or cork-cambium layer, the *periderm*, or *secondary cortex*, of muriform parenchyma with cuticularised walls filled with air, which is formed by the phellogen, and the *phelloderm*, or hypodermal chlorophyll-containing layer. (6) The *secretory system* comprises those more or less disconnected elements imbedded in tissues of other systems but devoted to special secretions, such as oil-cavities, resin-passages, and

laticiferous tissue. Many of these tissues and tissue-systems are separately described.

Hittites, an extinct civilised people, who appear to have flourished about 1200 B.C., when their empire extended from the Upper Euphrates westwards to the Ægean Sea and southwards to Syria, where they were conterminous with the Aramæan Semites. Their capital was at Karkhemish, on the Euphrates, and other centres of their culture were Jerablûs and Hama (Hamath), near the present Aleppo, in all of which places certain presumably Hittite stone inscriptions have been discovered in recent years. The attempts hitherto made to decipher these inscriptions have led to no certain results. The letters, which strongly resemble those found in 1879 by Professor Sayce on the so-called "False Ramesis" near Smyrna, seem to be partly ideographic, partly syllabic, or intermediate between hieroglyphics and phonetic writing. But their true character, as well as the language in which they are written, is still matter of conjecture. The term "Hittite," applied to this unknown people, is purely conventional, and has reference to the Kittim (Cetthim) of Genesis x. 4, son of Javan, from whom they are supposed to be descended. (Rev. A. H. Sayce, *Journal of the Royal Asiatic Society*, 1882.)

Hoadley, BENJAMIN, son of the headmaster of the Norwich grammar school, was born in 1676, and became a fellow of St. Catherine Hall, Cambridge. Having taken holy orders and obtained preferment in London, he plunged into the controversy in which Atterbury was engaged as to the doctrine of non-resistance and the subordination of Church to State. His advocacy of anti-clerical doctrines was so much appreciated by Parliament that he was specially recommended to Queen Anne for promotion. On the accession of George I. he was made Bishop of Bangor, and in that capacity started the Bangorian controversy. His views were condemned by the Lower House of Convocation, and, to obviate any further discussion, the debating of any but formal matters was forbidden to that body for more than a century. He was raised successively to the sees of Hereford, Salisbury, and Winchester, and he lived to enjoy the revenues of the latter till 1761.

Hoang-ho, WHANG-HO, or YELLOW RIVER, one of the greatest of Chinese rivers, rises in the mountains of Tibet (lat. 34° N., long. 98° E.), and flowing N.E. traverses the province of Karsu and enters Chinese Tartary; then, sweeping round, it takes a course due S., dividing the province of Shense from that of Shanse. Finally, with a sharp bend to E. and N.E., it passes through Honan and Shantu, and empties the mass of yellow mud, from which its name is derived, into the Gulf of Pe-chi-li. Though it has a length of 2,500 miles and very considerable breadth, it is for the most part too shallow for navigation, and its liability to floods renders dykes necessary in many places. Tsinan and Kaifong are the chief cities on its banks.

Hoar-frost is the result of deposition of dew from the atmosphere at a temperature below that

of the freezing-point of water. The dew is thus not deposited as liquid, but as a crystalline solid, and aggregations of such solid particles produce various beautiful effects, sufficiently well known to need no description. [DEW.]

Hoazin, HOATZIN (*Opisthocomus cristatus*), a reptilian bird from the northern parts of South America, constituting Huxley's group Heteromorphæ. It is about 2 feet long, arboreal in habit, frequenting low bushes and shrubs on the banks of lagoons, feeding chiefly on the leaves of a species of Arum. The general plumage is greyish-brown, with white markings, and there is a long, flowing crest of narrow pointed feathers. It is also called the Touraco.

Hobart Pasha, the HON. AUGUSTUS HOBART-HAMPDEN, third son of the sixth Earl of Buckinghamshire, was born in 1822, and entered the Royal Navy early, serving with gallantry in the suppression of the slave-trade until 1845, when he was appointed to the royal yacht. In the Crimean War he obtained active command of the *Driver*, and did good work at Bomarsund and Sveaborg. Retiring on half-pay in 1860, he took a spell of blockade-running on the coast of North Carolina, and at the end of the War of Secession offered his services to Turkey, and suppressed the Cretan insurrection of 1867. He was now made a Turkish admiral, and undertook the reorganisation of the Sultan's navy; but as he was employed against our allies, the Greeks, his name was struck off our Navy List, and not restored until 1874. However, he incurred the same penalty three years later, when he had to command the Ottoman fleet during the Russian invasion. In 1881 he was created Mushir and Marshal of the Empire, and in 1885 not only was he recognised by our service, but he further received the rank of vice-admiral. He died very suddenly in 1887.

Hobart Town, the capital of Tasmania or Van Diemen's Land, was so named by the founder, Colonel Collins, in 1804, in honour of Lord Hobart, then Colonial Secretary. It stands about seventeen miles from the mouth of the river Derwent, stretching over a number of hills beside Sullivan's Cove, with Mount Wellington (4,166 feet) as a background. The Governor's residence is in the suburbs, and besides the Houses of Parliament, town hall, and museum, there are many fine buildings both public and private. It is the seat of an Anglican and a Roman Catholic bishopric. Ships of largest tonnage can enter the harbour, and a large export and import trade is carried on, whilst there is regular steam communication with the other Australian Colonies and with England. The chief local industries are brewing, tin-smelting, flour-grinding, and timber-sawing.

Hobbema, MEINDERT, a great Dutch landscape painter, of whose personal history little is known, except that he was a pupil of Jacob Ruysdael, and flourished from 1638 to 1709. Unlike his master, whom he surpassed in warmth of colour and freedom of treatment, he sought his subjects exclusively in his native country, and chiefly in the provinces of

Drenthe and Guelderland. He excels in depicting gloomy forest scenery with glints of sunshine, the foliage being rendered with marvellous fidelity. The figures introduced into his pictures are often the work of Berghem, Van de Velde, and other contemporaries.

Hobbes, THOMAS, born in 1588, was brought up by his uncle, who sent him to Magdalen Hall, Oxford. There he seems to have learned little but contempt for scholastic pedantry and aggressive Puritanism. In 1608 he became tutor to William Cavendish, Baron Hardwick, afterwards Earl of Devonshire, and accompanied him abroad for some years, acquiring thus a knowledge of the new intellectual forces that were breaking up throughout Europe the barren system of the schoolmen. Under the influence of this awakening spirit, he resolved to make himself a classical scholar, and in this aim he persisted until 1629, when he published his translation of Thucydides, a work of considerable merit. For a time, meanwhile, he had been one of Bacon's secretaries, and had been much esteemed by him. His friend and pupil having now died, he again set out on a foreign tour with a youth named Clifton, and in the course of his reading became for the first time acquainted with Euclid's *Elements*, which gave a fresh impulse to his speculations. In 1631 he was called upon to take charge of the third Earl of Devonshire, son of his old pupil, and three years later set out with him for Italy and France, visiting Galileo and starting a correspondence with Descartes. By this time his mind was gradually shaping itself to definite ends, and at the age of fifty he had worked out the ground-plan of a novel philosophical system in which physical, metaphysical, moral, and political laws were to be explained as dependent upon motion, without which none of the phenomena of Nature could be distinguished by sense. As, however, the events of his time and the circumstances of his own life gave his thoughts a political bias, he began to construct his philosophical fabric from the top, and the earliest completed portions of the scheme were *Human Nature* and *De Corpore Politico*, in which authority—meaning for the moment the sovereignty and royal prerogative—is recognised as the basis of government and society. Neither of these works was published till ten years later, but they were read and talked about, so that the author deemed it advisable to retire to France when the Parliamentary cause showed its strength. He remained for eleven years in Paris. Meanwhile he worked at another instalment of his work, the *De Cive*, which was published at Amsterdam in 1647, though completed long before. With a view to adapting his theories to current events and to appealing to a larger audience, he next composed his famous *Leviathan*, the leading idea of which is that all individual human beings are built up into one gigantic organism, the State, the cementing power being self-interest only, and all civil and ecclesiastical authority being centred in the crowned head. Thus the work is virtually a defence of absolute monarchy against the Puritans, and of the Royal supremacy against Catholics and

Independents. Hobbes went home once more in 1652, when he was welcomed by his old pupil the Earl of Devonshire; in 1655 he produced *De Corpore*, the treatise with which his life's labour should have begun, but this was preceded by one of his most brilliant essays, *Of Liberty and Necessity*, in which he combated the doctrine of freedom of the will. About 1674 he retired to Chatsworth or Hardwick, and such was his vigour that he composed *Behemoth: or, a History of the Civil Wars from 1640 to 1660*, and translated the whole of the *Iliad* and *Odyssey*, though long past eighty. He was hard at work when paralysis struck him down in his ninety-second year (1679).

Hobby. [FALCON.]

Hoboken, a city and port on the Hudson river, New Jersey, United States of America, adjoining Jersey City and opposite to New York, with which it is connected by a steam-ferry. The name was brought from Holland by the original Dutch settlers. Picturesquely situated, the place is a favourite resort in summer, and a considerable ship-building and iron-founding industry is carried on, besides a large coal trade. Among public buildings the Stevens' Institute of Technology deserves special mention.

Hoccleve, or OCCLEVE, THOMAS, an early English poet, was probably born about 1370, studied law at Chester's Inn, and was writer to the Treasury in the reign of Henry V. From his *De Regimine Principum* it may be gathered that he was a friend of the young princes, and he has left us the only contemporary portrait of Chaucer. His chief work, *The Story of Jonathan*, is pronounced by Hallam to be a feeble and frigid performance.

Hoche, LAZARE, born in 1768, enlisted at the age of sixteen, and soon rose to be a sergeant in the French Guards. His first distinction was won by protecting the queen against the mob, but he adopted the cause of the Revolution, fought bravely at Thionville and Neerwinden, and as general of brigade assisted Souham in defending Dunkirk against the Duke of York. The command of the army of the Moselle was now given to him, and though unable to prevent a junction between the Austrians and Prussians, he defeated the former at Weissenburg (1793). Robespierre caused him to be thrown into prison, but at the end of the Terror he was liberated and sent to pacify La Vendée and Brittany. Here he was quite successful, and his next duty was to lead the futile expedition of 1796 against Ireland. In the following year he succeeded Jourdain in the command of the army of the Sambre and Meuse. On the eve of a decisive victory the Peace of Leoben put an end to hostilities. Six months later Hoche died very suddenly at the age of thirty-three.

Hodgkinson, EATON, was born in 1789, and was educated with a view to the Church, but, under the influence of Dr. Dalton, he turned his attention to mechanics. His researches into the laws that govern the resistance of materials to strain or pressure, conducted with the aid of Sir W. Fairbairn, marked a new epoch in railway engineering.

In 1841 he was made F.R.S., and in 1847 was appointed professor of engineering in University College, London. Stephenson entrusted to him the experiments that preceded the construction of the Britannia Tubular Bridge. He died at Manchester in 1861.

Hodograph in kinematics is a curve of velocities. If a point move along any path its speed at any point has a definite value, and it is then moving in a definite direction, tangentially to the curve at that point. If from any convenient point lines be drawn representing in magnitude and direction the velocities of the actual moving point along its path of motion, the extremities of these lines will be a series of points forming a new curve. This is called the hodograph, and the rate of motion of the hodograph point measures the acceleration, or rate of change of velocity of the moving point. The hodograph of a projectile is a straight line; that of any planet, in regard to its motion round the sun, is a circle.

Hodson, WILLIAM STEPHEN RAIKES, son of an Archdeacon of Stafford, was born in 1821, and, joining the Indian army in 1845, went through the Sutlej campaign, and distinguished himself at Sobraon. As commandant of the Guides Corps he did excellent work in 1852-53 against the Black Mountain tribes and the Affridis. On the outbreak of the Mutiny he raised the corps known as Hodson's Irregular Horse, which took an active part in the operations before Delhi. He captured two of the young princes, whom he shot to prevent their rescue, an act which provoked considerable discussion. He was killed at the capture of Lucknow in 1858.

Hoeven, VAN DER, JAN, was born at Rotterdam in 1801, and studied medicine at Leyden, where, after practising for some years as a physician, he became, in 1835, professor of zoology. His *Manual of Zoology*, translated into English in 1854, was long regarded as one of the best text-books of that science. He died in 1868.

Hof, or REGNITZHOF, a town in the circle of Upper Franconia, Bavaria, on the left bank of the Saale, 32 miles N.E. of Bayreuth, and at the junction of several railways. As the administrative centre of the district, it contains the usual public institutions, including an ancient hospital dating from the 13th century. The manufacture of cloth and cotton goods and the working of marble and iron are the chief industries. Founded in 1080, the town passed through many historical vicissitudes until its final annexation by Bavaria in 1810.

Hofer, ANDREW, born at St Leonhard, in the Passeyer Thal, Tyrol, in 1767, succeeded to his father's business as an innkeeper and dealer in wine and horses. When in 1796 the French invaded the country, he was at the head of a company of volunteer riflemen, and to him was chiefly due the organisation of the military resources of the Tyrol, the negotiations with Austria, and the rising against the French and Bavarians in 1809. He was so successful at Sterzing and Innsbruck that, after the defeat of the Austrians at Wagram, he resolved to continue

the struggle, and for some time kept the enemy at bay. Finally compelled to submit, he took up arms again on hearing that Austria was in the field, but his followers never rallied to him, and he was caught in the mountains through the treachery of Donay, a priest, brought to Mantua, tried by court-martial, and shot, contrary to its sentence, February 20, 1810, at the express order of Napoleon.

Hoffmann, AUGUST HEINRICH, born at Fallersleben in Lüneburg, 1798, completed his education at Bönn and Göttingen, and became in 1830 professor of language and literature at Breslau, whence he was expelled in 1842 owing to the Liberal tone of his *Unpolitische Lieder*. Though restored to favour after the Revolution, he never resumed teaching, but maintained himself by literature, excelling as a song-writer and an investigator of early German philology. His *Songs for Children* may be regarded as his best work. In 1860 the Duke of Ratibor appointed him his librarian, and this position he held at his death in 1874. He is often spoken of as Fallersleben.

Hoffmann, ERNST THEODOR WILHELM, was born at Königsberg in 1776, and, his parents having separated, the wayward but intelligent child was brought up rather erratically. He showed great versatility of talent as a musician, a painter, and a romancist, but for profession adopted the law. In 1806 he seems to have lost his official position, and for eight years he struggled on in great poverty as a composer, teacher, and theatrical director. When peace came in 1814 he received a legal post at Berlin, and died in 1822. His first and most remarkable work is the *Phantasiestücke*, for which Jean Paul Richter wrote an introduction.

Hoffmann's Violet, a fine violet dyestuff, closely related in its chemical nature to the well-known dye *fuchsine* (q.v.) or *magenta*.

Hofmann, AUGUST WILHELM, F.R.S., born at Giessen in 1818, became assistant to Liebig, and was appointed to a chemical professorship at Bonn, whence, at the age of twenty-seven, he was transferred to London as superintendent of the Royal College of Chemistry, and ultimately of chemist to the Mint. In 1865 he returned to Germany to fill the chair of chemistry in the university of Berlin. He has written several valuable treatises on organic chemistry, and his *Introduction to Modern Chemistry* is a valuable educational work, but his fame rests mainly upon his discovery of aniline and its utilisation in the arts for the production of a new series of colours. He died in 1892.

Hog, a gelded pig. [BOAR, FIG.]

Hogarth, WILLIAM, was born in 1697. He had a taste for drawing, and was apprenticed to a silversmith as engraver. In 1718 he set to work upon copper, executing book-plates and other modest designs, but finding time to improve his knowledge of drawing and painting and to cultivate that invaluable gift—a power of retaining impressions once gathered by the eye. His own disposition and the circumstances under which he worked inclined him towards satire. One of his

earliest known efforts is *The Lottery*, a skit on South-Sea speculation, and then follow masquerades and operas (1724), some caricatures of Kent, the architect, and illustrations of Butler's *Hudibras*. He next took to painting portrait groups, which sold readily, and in 1729, being in receipt of a small income, he ran away with the only daughter of his master, Sir J. Thornhill, R.A. For five years he produced nothing of great merit, but it is certain that he was at work upon the series of moral pictures which were destined to make him famous, and in 1734 appeared *The Harlot's Progress*, achieving at once a marvellous success. *The Rake's Progress*, brought out in the next year, was not quite so popular, but the subscription for the engravings of both amounted to a handsome sum. A number of paintings and plates appeared during the nine ensuing years. In 1744 *The Marriage à la Mode* in six scenes showed a remarkable development of his talent; yet as pictures these splendid performances turned out unprofitable. The engravings sold well enough, but the canvases fetched beggarly prices. On the other hand, he was well paid for portraits, such as those of Garrick and Lord Lovat, and he earned a good deal of money by the plates of *The Stage Coach*, *The Industrious and the Idle Apprentice*, *The Election*, *The March of the Guards to Finchley*, *Beer Street*, *Gin Lane*, and *Calais Gate*. He died in 1764.

Hogg, JAMES, "The Ettrick Shepherd," was born in 1770, in Ettrick Forest, and from his mother, Margaret Laidlaw, he inherited a taste for ballad poetry and ancient traditions. Owing to his father's ruin, he had, as a mere child, to seek his own livelihood, and in 1790 found himself in the service of Mr. Laidlaw of Yarrow, who fostered his turn for verse and introduced him to Sir Walter Scott. His first effort, *The Mistakes of a Night*, appeared in 1794, and a rather poor volume of collected poems saw the light in 1801. *The Mountain Bard*, six years later, gave promise of better things, but the little profit that resulted was lost in farming. He now started as a literary man in Edinburgh, and *The Queen's Wake* (1813), by far his ablest work, brought him into notice. He died 1835. *Kilmeny* is an admirable fairy-tale, and *The Shepherd's Calendar* testifies to his ability as a writer of prose.

Hoggar (properly AHAGGAR), a large branch of the Tuaregs (Saharan Berbers), who occupy the Ahaggar uplands and roam thence in all directions along the caravan routes. They form a confederacy of fourteen noble tribes and of numerous pastoral, trading, and agricultural tribes, who are treated as serfs, though all alike claim descent from a common mother-tribe, the Kel-Ahamellen, whose territory lies between Ahaggar and the Twat oasis. Some of the Hoggars were implicated in the massacre of the French expedition, under Colonel Flatters, which was despatched from Algeria in 1882 to explore the Central Sahara. (H. Duveyrier, *Les Tuaregs du Nord*, Paris, 1864; F. Bernard, *Quatre Mois dans le Sahara*, 1884.)

Hog Rat (CAPROMYS), a genus of Rodents of the family Octodontidæ, with two species from Cuba, and one from Jamaica. They are nocturnal

animals, partially arboreal, and live chiefly on vegetable food. The total length is about 22 inches. The long harsh fur is a mixture of black and yellow hairs, the belly is rusty yellow, and the tail is stout and rat-like. The negroes hunt these animals for the flesh, of which they are very fond.

Hogue, BATTLE OF LA. In May, 1692, James II., with the assistance of Louis XIV., had collected at Cape La Hogue a large army for the invasion of England. To clear the Channel for its passage, a formidable French fleet, under Tourville, was sent to sea. This was met off Cape Barfleur and engaged on May 19th by the combined Anglo-Dutch squadrons, under Admiral Edward Russell; and on that and the three following days about half the French force was destroyed either off Cape Barfleur or off La Hogue, thanks largely to the superior strength of the allies.

Hohenlinden, a Bavarian village, 20 miles east of Munich, made memorable by the victory won by Moreau, in command of the French, over the Austrians, under the Archduke John (Dec. 3, 1800)—a victory rendered famous in England by Campbell's spirited lyric.

Hohenschwangau, the name at present borne by a castle occupying the site of the ancient Schloss Schwanstein on the river Lech in South Bavaria. It was acquired by Maximilian II. of Bavaria, then Crown Prince, in 1832, and rebuilt by Quaglio and Ohrmüller in mediæval style, many distinguished artists being employed in the internal decorations. The late King Ludwig, however, abandoned it for another isolated palace erected close by and called Neuschwanstein, where he spent much of his time in eccentric seclusion.

Hohenstaufen, the name of a dynasty which occupied the imperial throne of Germany from 1138 to 1254. In the 11th century Frederick von Staufen, son of Frederick von Büren, was rewarded by the Emperor Henry IV. with the hand of his daughter and the Duchy of Swabia. His younger son Konrad, Duke of Franconia, after a long struggle with Lothar of Saxony, was ultimately elected Emperor in 1138, and was followed by his nephew, Frederick I., Barbarossa, 1152; Henry VII., 1190; Philip I., 1198; Frederick II., 1212; Conrad IV., 1251-54, when the imperial authority was for a time abrogated.

Hohenzollern, a principality of Prussia, which extends in a narrow strip between Württemberg and Baden. Its total area is 440 square miles, most of it mountainous and covered with pine-forests, but the valleys watered by the Neckar and the Danube, with their tributaries, are highly cultivated. The name is traced to the old feudal castle of Zollern, near Hechingen. The principality was divided into two in 1536, the southern and larger portion being known as Hohenzollern-Sigmaringen, whilst the northern part is Hohenzollern-Hechingen, the towns of Sigmaringen and Hechingen being the respective capitals.

Hohenzollern, THE FAMILY OF, traces its origin historically to Count Thassilo of Burchardinger, a Swabian, who built the castle of Zollern

early in the 9th century, and whose descendants, Conrad III. and Frederick IV., founded the Frankish and the Swabian lines of the house. The former prospered in course of time, and in 1415 acquired the Electorate of Brandenburg, which three centuries later was developed into the kingdom of Prussia, and this, again, became the head of the German empire. The Swabian branch has not fared so well. In the 16th century (see above) Eitel Frederick III. and Charles II. formally divided the state, and their descendants received princely rank from the Emperors; and in 1695 both the reigning princes agreed that, in the event of the failure of their issue, the Brandenburg house should inherit. However, in 1849 Prince Frederick William and Prince Charles Anton simultaneously resigned sovereignty to Prussia, reserving only their family estates and the rank of younger sons of the monarchy. More recently the Sigmaringen family has come into prominence, owing to the candidature of Prince Leopold for the throne of Spain (1870), the election of Prince Charles to the throne of Roumania (1866), and the adoption of Prince Ferdinand, husband of Princess Marie of Edinburgh, as his heir.

Holacanthus, a genus of Squamipinnes, with forty species, closely allied to, and having the same geographical range as, *Chaetodon* (q.v.), and resembling that genus in beauty of coloration. The preoperculum bears a strong spine at its angle, and the single dorsal has from twelve to fifteen spines. *H. imperator*, an esteemed food-fish, which the Dutch call the "Emperor of Japan," and *H. diacanthus*, are the best-known species.

Holbach, PAUL HEINRICH DIETRICH, BARON VON, was born at Heidelberg, in the Palatinate, in 1723. He appears to have inherited considerable wealth, and, coming to Paris, settled down there as the patron of the Encyclopædists and their allies. Helvetius, Diderot, D'Alembert, Rousseau, Condillac, Turgot, Hume, Wilkes, and Sterne were among his constant guests. Though a man of blameless life and average intelligence, he carried his attacks on religion and morality so far as to shock even Voltaire and Frederick the Great. His principal works are *Le Christianisme Dévoilé*, *Le Système de la Nature*, *Le Système Social*, *La Morale Universelle*, and *Bon Sens*, a popular treatise. Most of these were published anonymously, or under the pseudonym of "Mirabaud." He died in 1789.

Holbein, HANS, THE YOUNGER (1497–1543), a celebrated German painter, was born at Augsburg, probably in 1497. His father, HANS HOLBEIN THE ELDER (d. 1524), an excellent portrait-painter, is now believed to have executed many works which were formerly attributed to his son. Chief among these is the altar-piece of St. Sebastian at Munich, with a picture of the Annunciation on one wing and graceful figures of St. Barbara and St. Elizabeth on the other, surrounded by Renaissance ornament. In early life the younger Hans was much influenced by his predecessors in the new school which was growing up in Swabia and found its centre at Augsburg, especially by Martin Schongauer (d. 1488) and Hans Bockmaier (d. 1531). He appears to

have first visited Basel in 1516, but he did not take up his residence there permanently till 1520. The earliest works which are undoubtedly his include a painting on a table at Zürich, representing the devastation in the shape of household breakages worked by "St. Nobody" (1515); portraits of Jacob Meyer, burgomaster of Basel, and his second wife (1516); and the humorous pen-and-ink designs for Erasmus's *Praise of Folly*, now in the Basel Museum. The fine portrait of Bonifacius Amerbach was produced in 1519. After his return to Basel he found occupation in wall-painting, designing for glass, and illustrating books. A water-colour sketch of the famous *Peasant's Dance*, one of the wall-paintings on a house in the Eisengasse, is preserved in the Basel collection. His series of historical paintings and emblematical figures for the Town Hall was probably discontinued owing to the disturbances caused by the Peasants' War. Between 1515 and 1528 he executed numerous title-pages, ornamental alphabets, and other designs for various Basel printers, besides illustrating several editions of Luther's New Testament (1522–23). To the same period belong also the wonderfully graphic series of allegorical woodcuts called the *Dance of Death*—the most perfect specimens of his skill in the treatment of ideal themes—and the similar series representing scenes from Old Testament history, which are no less remarkable for their realistic vigour. These designs were engraved by Hans Lützelburger. His most important religious pictures are the *Solothurn Madonna* (1522), probably painted for the cathedral of Solothurn, and the *Meyer Madonna*, in which the burgomaster and his family are represented in adoration before the Virgin and infant Christ. Two portraits of Erasmus belong to the year 1523. Late in 1526, or early in 1527, he came to England, and appears to have remained in this country for about eighteen months. From Erasmus he received an introduction to Sir Thomas More, in whose house he seems to have spent the greater part, if not the whole, of his time. He now began the series of portraits of English celebrities which perhaps constitute his chief title to fame. The oil-paintings of this period include those of Archbishop Warham; Nicholas Kratzer, the royal astronomer; Sir Henry Guildford, Master of the Horse; and the *Family of Sir Thomas More*, the original sketch for which is preserved in the Basel Museum. During his residence in Basel from 1528 to 1531 he produced a picture of his own family (1529) and two portraits of Erasmus—one a painting, the other a woodcut (1530)—and completed the decoration of the Town Hall by adding paintings representing the colloquy between Rehoboam and the Israelites and the meeting of Samuel and Saul. After his return to England in 1531 he was much employed by the Hanseatic League, and painted several portraits of the Steelyard merchants, one of which—that of Jörg Gyze—has been warmly praised by Mr. Ruskin. The allegorical pictures the *Triumph of Riches* and the *Triumph of Poverty* were painted for the Steelyard on the occasion of Henry VIII.'s marriage to Anne Boleyn (1533). To the same year belongs the painting at Longford Castle called the *Scholars*, the figures in which are

said to be Sir Thomas Wyatt and John Leland. After his entrance into the king's service in 1536, Holbein painted a cartoon in fresco with figures of Henry VIII., Jane Seymour, Henry VII., and Elizabeth of York, and a beautiful half-length portrait of Jane Seymour, now in the Belvedere in Vienna. He was twice sent abroad by the king to paint portraits of ladies whom he proposed to marry, and his pictures of Christina of Denmark (1538) and Anne of Cleves (1539) rank amongst his choicest works. Of his numerous other portraits mention must be made of those of Hubert Morett the goldsmith, Thomas Howard, Duke of Norfolk, and of the picture entitled *The Ambassadors*, recently acquired by the National Gallery. Many of these portraits, or of the sketches for them, are preserved in the royal collection at Windsor. Holbein's death, which was caused by the plague, is now ascertained to have taken place in 1543.

Holberg, LUDWIG, BARON (1684–1754), Danish man of letters, was born at Bergen, in Norway. After studying at Copenhagen, he travelled in England (where he passed two years at Oxford), Holland, France, and Italy. He was successively appointed professor of metaphysics (1718), eloquence (1720), and history (1730) in the university of Copenhagen, of which he became rector in 1735. His genius was first displayed in poems of a satirical character, chief among which was the serio-comic epic *Peder Paars* (1720), directed against his countrymen. After the establishment of a theatre at Copenhagen (1721), he turned his attention to comedy, and wrote several plays, which were acted with much success. His other works include a *History of Denmark*, a humorous romance entitled *The Subterranean Travels of Niels Klim* (1741), and an *Autobiography* (1727–43).

Holcroft, THOMAS (1745–1809), dramatist and novelist, born in London, was the son of a shoemaker, who sometimes gained a livelihood as a pedlar and by letting out horses. After abandoning in turn the occupations of a stable-boy, a cobbler, a schoolmaster, and a strolling player, the younger Holcroft produced a play called *The Crisis*, which was acted at Drury Lane in 1778. Besides numerous comedies, of which *The Road to Ruin* (1792) was the most popular, and several translations, he wrote four novels, in the first of which, *Alwyn* (1780), he described some of his own adventures. In consequence of his sympathy with the French Revolution he was in 1794 imprisoned on a charge of treason, together with Thomas Hardy and others, but he was dismissed without being brought to trial. His *Memoirs*, begun by himself and completed by Hazlitt, are described by Moore as “amongst the most interesting specimens of autobiography we have.”

Hold, the whole interior cavity of a ship, especially that part of it between the inner bottom and the lower deck. It is generally used to contain ballast, water, and stores, and in merchant-ships it affords the chief stowage for the cargo.

Holden, ISAAC (b. 1807), inventor, was born in Renfrewshire. After working in a cotton-mill, he became an assistant-teacher, and, whilst

engaged in giving lessons in chemistry at Reading, discovered the principle of the lucifer match (1829). In 1846 he started a mill of his own near Paris, in conjunction with a Mr. Lister. His partner subsequently withdrew, and the works were transferred to the neighbourhood of Bradford. He first entered Parliament in 1865, and now represents the Keighley division of Yorkshire.

Holactypus, a sea urchin common in the oolitic limestones and clays of England. It has a low rounded or conical form, a large mouth with the anus on the lower side or just on the lower angle of the margin. The interesting point about the genus is the possession of jaws, which in the allied *Galerites*, etc., are absent.

Holidays. The number of holidays (*i.e.* “holy days”) which had their origin in religious observances [FESTIVALS] has been reduced to two, exclusive of Sundays—viz. Christmas Day and Good Friday, but new public holidays have been created by recent legislation. [BANK HOLIDAYS.] When a bill of exchange falls due on a bank holiday it becomes payable on the following day. No other holidays are recognised by the State.

Holinshed, RAPHAEL (d. 1580?), chronicler, was probably the son of a landed proprietor in Cheshire. Soon after the accession of Elizabeth he came to London, and obtained work under Reginald Wolfe, the royal printer, whom he assisted in preparing the descriptions of England, Scotland, and Ireland, based on the MSS. of Leland, which were to form part of his *Universal Cosmographie*. After the death of Wolfe (1573) this large design was abandoned, but Holinshed, in conjunction with William Harrison (q.v.) and Richard Stanishurst, was instructed to proceed with the parts relating to Great Britain. *Raphael Hollingeshed's Cronycle* was published in 1578, his own contributions consisting of the history of England to 1577, of Scotland to 1571, and of Ireland from its conquest to 1509. A new edition with continuations and insertions appeared in 1586 after his death. During the latter part of his life he appears to have been steward to Thomas Burdet of Bramcote in Warwickshire. Holinshed was diligent in the search of authentic materials, and his work may be accepted as a trustworthy source of historical information. A further interest attaches to it from the fact that it furnished the plots of Shakespeare's historical plays and other Elizabethan dramas.

Holl, FRANK, R.A. (1845–88), was the son of Francis Holl, A.R.A., a well-known London engraver. In 1863 his *Abraham about to Sacrifice Isaac* won the gold medal awarded to students by the Royal Academy. He was elected A.R.A. in 1878, and R.A. in 1883. After 1880 he devoted himself mainly to portrait-painting, a sphere in which he earned the greatest distinction. Among his best portraits are those of General Roberts (1882), the Duke of Cambridge, Lord Wolseley, and Mr. Bright (1883).

Holland, the popular name of the Netherlands, a maritime kingdom situated between lat. 50° 46' and 53° 34' N., and long. 3° 22' and 7° 14' E. It is

bounded by the North Sea on the north and west, the kingdom of Prussia on the east, and Belgium on the south, and comprises an area of 12,744 square miles, exclusive of the grand-duchy of Luxemburg (q.v.), which since 1867 has formed a neutral territory under the sovereignty of the King of Holland. Its greatest length from north to south is 195 miles, and its greatest breadth from east to west 110 miles.

Political Divisions and Population. Holland is divided into the following eleven provinces:—

Province.	Area in square miles.	Population, Census 1889.	Capital.
North Brabant	1,980	509,628	{ Hertogenbosch, or Bois-le-Duc.
Drenthe ...	1,028	130,704	Assen.
Friesland ...	1,282	335,558	Leeuwarden.
Groningen ...	887	272,786	Groningen.
Guelderland ...	1,965	512,202	Arnhem.
North Holland .	1,070	829,489	Haarlem.
South Holland...	1,166	949,641	The Hague.
Limburg ...	851	255,721	Maastricht.
Overijssel ...	1,291	295,445	Zwolle.
Utrecht ...	534	221,007	Utrecht.
Zeeland ..	690	199,234	Middelburg.
Total ...	12,744	4,511,415	—

The population at the end of 1891 was estimated at 4,564,565, which gives an average of 358 per square mile. In South Holland, however, there are over 800 inhabitants per square mile, and the population of North Holland is hardly less dense. Rather less than one-third of the whole population is urban. The four largest towns are Amsterdam, the capital (population 426,914), Rotterdam (216,679), The Hague (165,560), and Utrecht (87,911). Groningen, Haarlem, and Arnhem have each between 50,000 and 60,000 inhabitants.

Physical Aspect and Climate. The surface is everywhere flat, consisting for the most part of alluvial deposits dropped by the Rhine, Maas, and Scheldt on their way to the North Sea. The greater part of the country is below the level of the sea and watercourses, the difference along the coast amounting in many places to 20 or 25 feet. In the highest districts—such as the Veluwe in Guelderland—the land does not rise more than about 350 feet above the sea-level. In most places the encroachments of the ocean can be kept out only by means of stout dykes or embankments constructed of earth, sand, and mud, and covered with plaited osiers, the gaps between which are filled with clay. They are often planted with trees, in order that the roots, striking downwards, may render the rampart more secure; in other cases the sides are protected by masonry. Dykes are necessary as a defence against the swollen rivers as well as the sea, and, as fresh alluvial deposits are always being formed, they require to be constantly raised in height. The largest dykes are those of the Helder at the northern extremity of North Holland, and of Westcapelle on the island of Walcheren. The canals, which intersect the whole country and are said to have a total length of 1,907,170 miles, serve a threefold purpose. (1) They are used for communication and traffic,

connecting the innumerable branches into which the great rivers divide themselves, and thus forming a means of access from one extremity of the country to the other. The old method of navigating the canals by means of *Trekschuiten*, barges for passengers drawn by horses or men, is now dropping out of use. (2) They drain the superfluous water from the land. For this purpose mills are placed along them at intervals, and the hydraulic works connected with these are constructed in such a manner that they can also be employed for irrigation. Corn, paper, timber, and tobacco mills are also abundant. These curious mills, with their round tops and huge sails, are a very striking feature in the landscape. (3) Canals are also used, as hedges and walls are in other countries, to mark the boundaries of fields and gardens. The chief canals are the North Sea Canal, connecting Amsterdam with the North Sea, the North Holland Canal, from Amsterdam to the Helder, which is 42 miles long, 43 yards wide, and 20 feet deep, and the Willem's Canal in North Brabant. The most fertile land of Holland is that in the beds of the "polders," tracts formed by draining marshes or lakes. The largest of these, the Haarlemmer Polder, reclaimed in 1840-53, extends over 72 square miles and supports 10,000 inhabitants. Other important polders are the Purmer (1608-12), Beemster, Schermer, and that of the Y, all in North Holland. A project is now under discussion for draining the Zuyder Zee. The construction and maintenance of dykes, canals, and polders is entrusted to a special department of the government, called the Waterstaat. Along the coast the "dunes," sandhills varying in height from 30 to 160 feet, form a characteristic feature in the scenery. Those situated farthest inland have been gradually taken into cultivation. The climate of Holland resembles that of England, but it is somewhat hotter in summer and colder in winter.

Government and Statistics. The Dutch Constitution was formulated in 1848 and revised in 1887. The legislative power is vested conjointly in the sovereign and the States-General, which is composed of two Chambers. The First Chamber consists of 50 members elected by the provincial councils for a period of nine years, from amongst the citizens who are most highly assessed, or who have occupied or occupy some important public position. The 100 members composing the Second Chamber are elected by direct suffrage. The electoral body, which now includes about 290,000 persons, consists of all male citizens over 23 years of age, and not specially disqualified, who pay a ground-tax of 10 guilders or a personal tax estimated as equivalent in amount, or who can be classed as lodgers by the terms of the law. A considerable extension of the suffrage, however, is contemplated (1893). Members of the Second Chamber receive an annual salary of about £166. The right of initiating legislation belongs to the Second Chamber alone, and the First Chamber is merely empowered to accept or reject Bills, not to amend them. The executive power is in the hands of the sovereign and eight responsible ministers, their respective departments being—(1) Foreign Affairs, (2) Interior, (3) Finance,

(4) Justice, (5) Colonies, (6) Marine, (7) War, (8) Public Works and Commerce (the Waterstaat). Ministers may sit and speak in either of the Chambers, but they have no vote. The sovereign is assisted by a "State Council," containing 14 members appointed by himself. 'S Gravenhage (The Hague) is the residence of the Crown and the seat of government. For purposes of local government the 11 provinces are divided into 1,123



MAP OF HOLLAND.

communes. The public revenue amounted in 1891 to £9,545,589, the expenditure to £11,327,570, and the debt to £91,376,761. All *religions* are tolerated, and several receive assistance from the state. About three-fifths of the inhabitants are Protestants, and most of the remainder Roman Catholics, but there are about 100,000 Jews, most of whom reside at Amsterdam. *Education* is not compulsory, and in 1890 7·2 per cent. of the conscripts could neither read nor write, while in 1891 10 per cent. of the children between 6 and 12 were receiving no instruction of any kind. The state provides a system of primary education, and defrays about one-fourth of the expense, the remainder being borne by the communes. There are universities at Leyden, Utrecht, Groningen, and Amsterdam, and "Latin" schools in the various towns. The regular *army*, on a war-footing, contains about 69,000 men, exclusive of officers, and is recruited both by conscription and enlistment. The conscripts serve for the whole of one year and six weeks annually during the four following years. The defence of the country is entrusted to the "schutterij" (militia) and the "landstorm," which is composed of all the able-bodied inhabitants. The

navy consisted in July, 1892, of 152 men-of-war, with 6,000 sailors.

Industry. The Dutch are eminently an agricultural people. From the earliest period of their history they have striven with indomitable energy to turn to the best advantage the soil which they hold from nature on so precarious a tenure. At the present time some 2,634,000 acres are still covered by forest, heath, and swamp, while about 2,826,000 acres are devoted to pasture, and 2,150,000 acres to tillage. Large farms predominate in N. and S. Holland, Zeeland, and Groningen; small farms in North Brabant, Limburg, Guelderland, and Overijssel. In 1889, 58·8 per cent. of the total area under cultivation was occupied by peasant proprietors. Dairy-farming is the chief occupation of the rural population, and the country has long been famed for its cattle, butter, and cheese. The disease among cattle and sheep, which reached its height in 1874, gave a temporary check to the exportation of live stock, but this branch of trade is again reviving. The Dutch were slow to adopt improved methods of farming, and their trade suffered in consequence; but there has been an advance in this respect of late years. The chief crops raised are rye, potatoes, oats, wheat, chicory, flax, and tobacco. Tulips, hyacinths, and other bulbs are grown extensively at Haarlem. The only *mineral* product which exists in any abundance is potter's clay. There are coal-mines in Limburg, and the curious sandstone quarries at Maastricht are of some commercial importance.

The following are the chief *manufactures*, with the places at which they are carried on:—Woollen goods—Leyden, Tilburg, Veenendaal; linens and damasks—Hertogenbosch; calicoes, table-cloths, etc.—Amersfoort, etc.; silk stuffs and dyed silks—Roermond, Utrecht, etc.; leather, glass, firearms—Maastricht, Delft. Schiedam has long been famous for its gin distilleries. Breweries abound, and the manufacture of liqueurs is an important branch of industry. Margarine is the staple product of North Brabant, and there are now extensive cocoa works at Weesp, near Amsterdam, and elsewhere. Diamond-cutting is still carried on at Amsterdam, but not to the same extent as formerly. The pottery and porcelain industry of Delft, famous in the 17th and 18th centuries, has recently been revived. The number of vessels engaged in the *fisheries* in 1891 was 4,427. The produce of the North Sea herring fishery realised about £502,500. 16,449,888 oysters were taken, one quarter of which were exported to England.

Commerce. Foreign trade is practically unrestricted. The duties on manufactured articles seldom exceed 5 per cent. of the value, and in many cases no duty at all is levied. The large volume of trade hardly affords a fair test of the internal resources of the country, for Holland still occupies a leading position in the carrying trade of the world. The value of imports for home consumption was about £108,312,000 in 1890, and £113,004,000 in 1891, that of exports of home produce £90,627,000 in 1890, and £95,039,000 in 1891. 19·9 per cent. of the imports came from Great Britain, 18·5 from Prussia, and 13·7 from Belgium,

while in regard to exports these three countries stood in the ratio of 25·9, 46·7, and 13·1 per cent. respectively. The chief articles exported to Great Britain (in the order of their value) were margarine, woollen goods, sugar, leather and leather goods, cotton goods, iron and steel goods, butter, cheese, live stock, and gin.

History. The earliest inhabitants of Holland of whom there is any historical record were the Batavi, supposed to have been a tribe akin to the Catti, who settled in the island of Betuwe between the Rhine and the Waal. After the Romans had reduced the Belgæ, the Batavi became their allies and furnished a contingent to the Roman army. In the 4th century the country was overrun by the Salic Franks, who were soon afterwards followed by the Frisians and Saxons. The Batavi appear to have become merged in the Frisians, who occupied the district along the sea-coast. Towards the close of the 8th century this region was incorporated in the dominions of Charles the Great.

Under the feeble rule of Charles' successors the allegiance of the imperial delegates became merely nominal, and, in cases where the offices were held by laymen, they were usually handed on from father to son. In this manner feudalism grew up in the Netherlands as it did in other parts of the Empire. The most powerful lords were the Count of Holland and Bishop of Utrecht in the north, the Duke of Brabant and Count of Flanders in the south. The commercial stimulus given by the Crusades resulted in the growth of chartered towns, and Bruges became the main dépôt for the spices and other goods of the East. Trade with the Hanseatic League, and the growth of the woollen and linen manufactures, contributed to the prosperity of the Flemish cities. Industry in the Netherlands received no serious check until the various petty fiefs became consolidated under the House of Burgundy, who gained a footing in the country by the marriage of the first duke to the heiress of the Count of Flanders (1384). His grandson, Philip the Good, who ruled the duchy from 1419 to 1467, succeeded in possessing himself of the whole seventeen provinces. He and his son Charles the Bold (1467-77) regarded the Flemish cities merely as a means of recouping their exhausted finances. Mary, the daughter of Charles, granted the "Great Privilege," which has been called the "Magna Carta" of the Netherlands, but after her death (1482) it was set aside by her husband, the Emperor Maximilian, who compelled the Netherlands to recognise him as the guardian of his young son Philip. The Great Privilege remained in abeyance under the Spanish successors of the house of Burgundy, who followed the same policy as their predecessors. The Emperor Charles V. increased the misery of the Netherlands by introducing the Inquisition (1550). The first resolute efforts at resistance date from the accession of his son, Philip II. The deliverance of the Netherlands could be brought about only through the influence of some man of commanding will and unbounded patriotism, and this man now appeared in the person of William of Orange (q.v.). In 1559 Margaret of Parma was appointed regent, with a council in which the influence of Orange and

Egmont was counterbalanced by that of Viglius, Granvelle, and Berlagmont. Exasperated by the severity of the Government the Flemish nobles formed the league of the Gueux (q.v.), which in 1566 wrung from Margaret an "Accord" consenting to the abolition of the Inquisition; but in the following year Alva arrived in the Netherlands with 10,000 men, and at once established his "Blood Council" or "Council of Troubles." Orange, who had escaped, collected troops and gained a victory in Friesland, which was avenged by the execution of Hoorn and Egmont (1568). Holland and Zeeland rose in revolt, and in a meeting of the Estates at Dordrecht, held under the authority of Orange as Stadtholder, it was resolved with enthusiasm to follow him as leader in the coming struggle. Orange now endeavoured to unite his forces with those of the French Huguenots, but this design was frustrated by the massacre of St. Bartholomew, and he was compelled to abandon the Southern Netherlands to their fate. Left to struggle alone, the northern provinces gradually achieved their independence, although at first they met with frequent reverses, and it was not till 1581 that they ventured openly to renounce their allegiance to Philip. By the "Act of Abjuration" in that year William became ruler over the newly-formed Dutch Republic, the constitution and extent of which had been settled by the Union of Utrecht two years earlier. In 1584 he was assassinated at Delft by Balthasar Gérard, an agent of Alexander of Parma, who governed the Netherlands from 1578 to 1592. Under his son, Maurice of Nassau, one of the ablest strategists of the age, who held the office of Stadtholder from 1585 to 1625, the struggle was continued with increasing success. In 1609 a truce was concluded for twelve years, contrary to the judgment of Maurice, who was forced to yield to the importunity of the Dutch merchants. The interval of peace was mainly occupied by the disputes of the Arminians (q.v.) and the Gomarists, and it was partly on the ground of his Arminian views that Jan van Olden Barneveldt, the Pensionary of Holland, was executed at the Hague in 1619. His death, however, was really due to the machinations of Maurice, who found his ambitious projects thwarted by the independent spirit of the burghers. He was succeeded by his brother Frederic Henry, a skilful general and enlightened administrator, under whose rule the prosperity of the States reached its highest point. The war came to an end a year after his death, when the independence of the Netherlands was formally recognised by the Peace of Westphalia (1648). The period of Maurice and Frederic Henry was one of remarkable naval enterprise and commercial activity. The most remote parts of the world were explored by Linschoten, Heemskerk, Schouten, Lemaire, and a host of other famous navigators. The East and West India Companies, the former of which was established in 1602, rapidly gained possession of the Spanish and Portuguese settlements in both hemispheres. But the foundations of Dutch prosperity were threatened by the progress of her commercial rival, England. Cromwell's Navigation Act forced the Grand Pensionary, John de Witt, who

conducted the Government after the death of Frederic Henry's son William II. in 1650, to engage in a war (1652-54), which was marked by the exploits of Tromp and De Ruyter, but had no permanent results. Another naval war with England (1664-67) was equally indecisive. The attempt of Louis XIV. to gain possession of the Netherlands led to a war with France (1672), in which the neglected Dutch army was no match for the forces of Condé and Turenne, who captured the provinces of Guelderland, Utrecht, and Overijssel. The frenzy of the people, who ascribed their misfortunes to the treachery of the Government, found vent in a rising in which De Witt perished, and William III., Frederic Henry's grandson, was raised to the office of Stadtholder. William was an able tactician and diplomatist, and his elevation to the throne of England (1689) did not cause him to neglect the interests of his own countrymen. The Peace of Nymegen (1678) and that of Ryswyk (1697), which terminated the two campaigns against the French, both brought substantial advantages to the Dutch. After his death (1702), his cousin, John William Friso, Stadtholder of Friesland and Groningen, became captain-general of the army, but he was never elected Stadtholder of the United Provinces. The only result of the War of the Austrian Succession, as far as Holland was concerned, was the virtual extinction of her republic. In 1747 William IV., son of John William Friso, became hereditary Stadtholder. The attempts of the State to limit the powers of the Stadtholder, William V., were baffled by the intervention of the king of Prussia, and when the French invaded Holland under Pichegru (1794) they were welcomed with enthusiasm. After 11 years' existence the newly-constituted "Batavian Republic" was converted into a monarchy under the rule of Louis Bonaparte (1806); but the policy of Louis was too liberal for his brother's purposes, and in 1810 Holland was incorporated in the French Empire. At the end of 1813 William, the son of the last Stadtholder, was restored with the title of king, and by the Congress of Vienna (1815) Holland and Belgium were formed into a single State under his sovereignty. The difference of the two peoples in language, religion, and temperament rendered any real union impossible, and after the revolution of 1830 Belgium became a separate kingdom. During the revolutionary troubles in 1848 William II. was forced to grant a new constitution. The present queen, Wilhelmina (b. 1880), succeeded her father, William III., in 1890.

Literature. During the Middle Ages the literary genius of the Dutch displayed itself in numerous romances, fabliaux such as the famous *Reinaert*, and the didactic poetry of Jan Boendale, a writer of the 14th century. The germ of modern Dutch literature is to be found in the *Kamers*, or clubs of the *Rederijkers*, which grew up in the Netherlands early in the 15th century. Towards the close of the 16th century the Dutch *kamers* became important centres of literary activity. The movement towards a national literature which now set in reached its culminating point in the

works of the dramatist and historian Hoofdt (1581-1647), who is regarded by his countrymen as the creator of literary Dutch. But the most famous names of the 17th century are those of the poets Vondel (1587-1679) and Jacob Katz (1577-1660). In the writings of the former critics have discovered curious resemblances to Milton. The historian Brandt belongs to the same period. Latin was still the language of the learned, and Erasmus, Grotius, Spinoza, and Boerhaave wrote nothing in their native tongue. During the 18th century Dutch literature declined, but a new poet of genius appeared in Willem Bilderdijk (1756-1831), who did not live to complete his great epic, *The Destruction of the First World*. Of subsequent writers the most important are J. F. Helmers (1767-1813), author of *The Dutch Nation*, Hendrik Tollens (1780-1856), who produced numerous ballads and patriotic songs, Beets, whose *Camera Obscura* earned for him the title of the Dutch Charles Dickens, and the novelist and poet Hendrick Conscience (1812-83). The Biblical critic Abraham Kuenen (1828-91) earned a European reputation, as did the Greek scholar C. G. Cobet (1813-1888). Amongst living authors the novelist Maarten Maartens holds a high rank. In the literary history of Holland no distinction is made between Dutch writers in the strict sense and Flemish authors who have written in the Dutch language.

Holland, SIR HENRY, BART. (1788-1873), physician, was born at Knutsford in Cheshire. After studying at the universities of Glasgow and Edinburgh he settled in London (1816), where he became an eminent private practitioner. In 1852 he was appointed physician-in-ordinary to the Queen. He was also distinguished as a traveller, and in 1812 published his *Travels in the Ionian Isles, Albania, Thessaly, and Greece*.

Holland, HENRY RICHARD VASSALL FOX, third Baron (1773-1840), was the nephew of Charles James Fox. He engaged at an early age in parliamentary life, and became prominent as a supporter of Fox's policy. Throughout his life he continued to advocate Whig principles, and when his party came into power in 1830 he was made Chancellor of the Duchy of Lancaster. Holland House in Kensington, the residence of Lord and Lady Holland, was one of the chief centres of fashionable and literary life in London.

Holland, REV. HENRY SCOTT (b. 1847), was educated at Eton and Oxford, where he gained high honours. He was made a Canon of St. Paul's in 1884 and, owing to his eloquent preaching, has become one of the leaders of the High Church party.

Holles, DENZIL (1599-1680), statesman, was the son of the first Earl of Clare. He first entered Parliament in 1624, and immediately joined the opposition to Buckingham. For his share in the proceedings of March 2, 1629, when he forced the Speaker to remain in the chair while resolutions were passed against religious changes and the arbitrary levying of tonnage and poundage, he was

sentenced to a fine of one thousand marks and imprisoned for a time in the Tower. He was one of the "five members" whom Charles unsuccessfully strove to arrest on a charge of treason in January, 1642. He took an active part in the Civil War during its earlier stages, but afterwards advocated peace. Subsequently he became a leader of the Presbyterians in their struggle with the Independents, and, after the close of the war, opposed the claims of the army with so much resolution that he was compelled to withdraw to France. After the death of Cromwell he returned, and took a leading part in the restoration of the Stuarts. He was raised to the peerage as Baron Holles in 1661, resided in Paris as ambassador from 1663 to 1666, and was engaged in negotiating the Treaty of Breda (1667).

Holly (*Ilex Aquifolium*), a British evergreen tree belonging to the order Ilicineæ, with hard, even-grained white wood; smooth ash-grey bark; glossy, dark-green leathery leaves, with a spinous margin when near the ground, but with one spinous point higher up; flowers usually diœcious; and scarlet, or rarely yellow, berry-like but superior fruits, each with four one-seeded chambers. Many variegated varieties are in cultivation. Hollies flourish best on sandy soils, and form an undergrowth characteristic of some of our oldest forest tracts, such as the Forest of Dean, New Forest, and Epping Forest. The holly seems also to be often associated with pre-historic earthworks, and its use in winter decorations, whether of Roman or Teutonic origin, is undoubtedly very ancient. The tree is a valuable hedge plant. The wood is used in inlaying and turning, for ebony-stained tea-pot handles and walking-sticks, etc., and the leaves are employed in the Black Forest as tea, as on a far larger scale are those of *I. paraguayensis*, the maté tea (q.v.) of South America.

Hollyhock. *Althæa rosea, chinensis*, and *fiefolia*, are tall-growing perennial herbaceous members of the mallow family introduced into our gardens from the Holy Land. They grow best in a well-manured sandy loam either from seed or from cuttings. Their tall spikes of flowers vary much in colour, being white, yellow, pink, deep-red, violet or almost black, but never a true blue. Some have single and others double flowers. Their stamens are protandrous, and the pollen of each variety apparently prepotent on the stigmas of the same variety, so that these varieties are exceptionally true to seed. The ravages of a mildew (*Puccinia malvacearum*), which attacks the cellular tissue of the leaf, especially in dry seasons, have much diminished the cultivation of this group of plants.

Holman, JAMES (1786–1857), the "blind traveller," entered the navy, from which he was compelled to retire owing to the loss of his sight. He subsequently visited countries in all parts of the globe, and in 1834 published his *Voyage Round the World*.

Holmes, OLIVER WENDELL (b. 1809), American man of letters, was born at Cambridge, Massachusetts, and received his education at Harvard

University. After leaving college he studied medicine, and in 1836 took his degree of doctor in that faculty at Harvard. After holding a professorship of anatomy and physiology at Dartmouth College for two years (1839–41), he settled at Boston, where he has since resided. From 1847 to 1882 he was professor of anatomy in the medical college at Harvard. Dr. Holmes has published several works on medical subjects, but on this side of the Atlantic he is known chiefly in a literary capacity, and especially as the humorous author of *The Autocrat of the Breakfast Table*, *The Professor at the Breakfast Table* (1860), and *The Poet at the Breakfast Table* (1872). This entertaining series of "table talk" was published in the *Atlantic Monthly*, with which he became connected when it was started in 1857, and in which all his purely literary works written since that date have appeared. Before he made his mark in the *Atlantic Monthly*, Dr. Holmes had already gained some reputation as a poet. His early poems, a collection of which appeared at Boston in 1836, were chiefly occasional pieces of a humorous character. Since then his *Songs in Many Keys* (1862), *Songs of Many Seasons* (1875), and *The Iron Gate and Other Poems* (1880) have shown that he is a graceful writer of lyrics. His other works include *Elsie Venner, a Romance of Destiny* (1861), *Memoirs of J. L. Motley* (1878) and *R. W. Emerson* (1884), *A Mortal Antipathy* (1885), and *Our Hundred Days in Europe* (1887). *Over the Teacups*, published in the *Atlantic Monthly* in 1890, is in the same vein as the *Breakfast Table* papers.

Holmes, SIR ROBERT, naval commander, was born in 1622, and, when young, served in the army of Charles I. In 1649–50 he accompanied Prince Rupert's piratical squadron, and immediately after the Restoration commanded a force on the coast of Guinea. In 1664 he reduced the Dutch African settlements, and captured New York, and during the Dutch War he was present in all the principal battles. In 1666 he was knighted and made a rear-admiral, and in the same year he commanded a squadron which burnt an enormous amount of Dutch shipping in the Vlie. These services procured him in 1669 the governorship of the Isle of Wight. In 1672 he commanded the force which operated against the Dutch Smyrna fleet, and he was present in the *St. Michael* at the battle of Solebay. He died in 1692, and lies buried at Yarmouth, Isle of Wight.

Holmium, a rare metallic element which occurs together with other rare metals in a few minerals—*e.g.* *cerite, gadolinite*. There seems to be evidence for believing that, like other so-called elements of the same group (*e.g.* *Didymium*), holmium is not a true elementary body, but consists of probably four simple and distinct substances.

Holocystis, a genus of corals found in the Lower Greensand of the south of England. The genus is well-known, owing to the fact that the septa are arranged in multiples of four instead of six, and so it was for long included among the

Palæozoic group, the Rugosa (q.v.). It is, however, now regarded as an ordinary Astrean coral.

Holometabolic Insects are those in which the metamorphosis is complete, as in the butterfly—*i.e.* a quiescent resting stage (chrysalis) intervenes between the caterpillar and the imago or adult insect.

Holostomata, the division of Gastropoda (q.v.) which includes all those with a rounded, unnotched mouth. They belong to the Streptoneura and the subdivision Azygobranchia. [GASTROPODA.] They are all vegetable-feeders, whereas those with a notched mouth (*e.g.* the Whelks) are mostly carnivorous. The Top-shell (*Trochus*), the Winkle (*Littorina*), the Pondsail (*Paludina*) are well-known representatives. In order to base the nomenclature on the anatomy of the soft parts instead of the shell, it has been proposed to call the group "Holochlomyda."

Holothurians, or SEA-CUCUMBERS, one of the classes of the Echinodermata. They are elongated and worm-like in form, have soft bodies which may be strengthened by calcareous plates or spicules; they have a circle of tentacles around the mouth, and the madreporite, or opening of the water vascular system, hangs loosely in the interior. They are all marine, and live mainly among coral reefs, though one order (Elasipoda) inhabit the deep seas. As with most of the Echinodermata, the organs are arranged on a five-rayed plan. Thus there are five rows of tube feet, arising from five water vascular vessels. These are the usual means of locomotion, but in the *Synaptidæ* these are absent, and the Holothurian moves in a worm-like manner. Respiration is usually effected by a circle of tube feet round the mouth, which have been modified to form a number of branched feathery tentacles. At the other end of the alimentary canal is usually one or a pair of "respiratory trees." There is no certain representative of the circles of five plates which form the apical system (q.v.) of other Echinoderms. Owing to this, and the primitive nature of some other characters, many authors have sought in this class for the ancestor of the Echinoderms. The class is divided into three orders:—

1. *Elasipoda*: Primitive deep-sea forms, which are shaped like a slug; no respiratory trees.
2. *Pedata*: With tube feet.
 - (a) *Aspidochirota*: Tentacles with ampullæ; *e.g.* *Holothuria*.
 - (b) *Dendrochirota*: Tentacles arborescent; *e.g.* *Cucumaria*.
3. *Apoda*: No tube feet.
 - (a) *Pneumonophora*: Respiratory tree loosely attached.
 - (b) *Apneumona*: No water vascular vessels or respiratory trees.

As is natural with a group having some slight skeletal structures, they are of little interest geologically. Spicules are, however, known from the Carboniferous period upward, and are not uncommon in some formations.

Holotricha, an order of Infusoria (q.v.), including all those in which the cilia are uniform in size and are arranged in parallel lines over the whole body. There may be one band of somewhat larger cilia round the mouth.

Holstein was prior to 1866 a duchy in the kingdom of Denmark and also a member of the Germanic Confederation, but since its conquest by Prussia it has, together with Schleswig (q.v.), formed a province of the latter kingdom. It is bounded by Schleswig on the north; the Baltic Sea, Lübeck, and Mecklenburg on the east; Lauenburg on the south-east; the North Sea on the west; and Hamburg and Hanover on the south and south-west. The soil is chiefly sand and clay, and the surface gently undulating; heaths are common in some parts, but elsewhere the land is fertile, especially in the marshy districts. The chief natural products are salt, gypsum, peat, and, on the eastern coast, amber. Agriculture and cattle-rearing form the chief occupations of the inhabitants.

Holt, SIR JOHN (1642–1710), judge, was born at Thame, in Oxfordshire. He was called to the bar in 1663, and some twelve years later began to make his mark as one of the leading counsel of the day. In the State trials which grew out of the alleged Popish and Rye House plots he was frequently engaged on the side of the defendants. From 1689 to 1710 he was Lord Chief Justice of the King's Bench. His unswerving integrity gained him universal esteem.

Holtz Machine is one of the earlier forms of electrical machines for the separation of electricity and the production of such at high pressure or potential. The best modern form is, however, due to Wimshurst, whose machine is described in detail; it is thus unnecessary to explain the Holtz machine, except to remark that it works upon the same principles of induction and accumulation of charges, but is less effective than the Wimshurst machine. [ELECTRICITY.]

Holy Alliance, a league formed by Austria, Prussia, and Russia, in September, 1815, after the fall of Napoleon, with the nominal object of taking religion as their sole guide both in their mutual relations and in the administration of their internal affairs. The real object of the league was to maintain the power of the existing dynasties and to check the growing Liberalism which resulted from the French Revolution. On the part of England, Lord Castlereagh refused to accede to it; but its principles were in some measure represented by the Liverpool Government, especially in the years 1816–20.

Holy Grail, sometimes the dish, but more generally the cup used at the Last Supper; there are many legends connected with the search for the grail, and of its miraculous food-producing powers. [GALAHAD, PARSIFAL.]

Holyhead, a small island off the west coast of Anglesey, North Wales, with which it is connected by a causeway. The town of Holyhead, a port and parliamentary borough on the north side of the island, is important as the terminus of the London and North-Western Railway, whence the mail-packets start for Dublin, sixty miles distant. The harbour underwent great improvements between

1850 and 1880, and the roadstead, which now comprises some 400 acres, is defended by a stone wall nearly 40 feet high. The inhabitants are engaged chiefly in ship-building, rope-making, and the coasting trade.

Holy Island, or LINDISFARNE, an island off the coast of Northumberland, $9\frac{1}{2}$ miles south-east of Berwick-on-Tweed, covering 2,457 acres. At the south-east end there is a castle dating from about 1500. The famous monastery of Lindisfarne was founded in 635 by Oswald, King of Northumbria, who made it the seat of a bishopric, the first occupant of which was St. Aidan. The cathedral was in 1093 converted into a Benedictine priory, of which there are still considerable remains.

Holyoake, GEORGE JACOB (b. 1817), social reformer, was born in Birmingham, where for many years he worked in an iron-foundry with his father. He afterwards adopted the social and religious views of Robert Owen (q.v.), by whose disciples he was sent to various parts of England for the purpose of disseminating his principles. In the course of his wanderings he was arrested at Cheltenham and imprisoned in Gloucester gaol on a charge of atheism (1841). After his release he came to London, and established a printing and publishing office in Fleet Street. He has been an active supporter of political and social reforms and, as editor of the *Reasoner* and other free-thought periodicals, has done much to promote a spirit of toleration in the discussion of public questions. Mr. Holyoake's name is especially identified with the Co-operative movement, and he took an active share in assisting Garibaldi during the Italian War of Independence.

Holyoke, a city on the Connecticut river in Massachusetts, United States, eight miles north of Springfield. Paper-making is carried on very extensively.

Holyrood, an abbey and palace in Edinburgh. The Augustinian abbey was founded in 1128 by David I., King of Scotland, in consequence of his miraculous preservation from the attack of a hart, whilst hunting, through the interposition of a hand holding a flaming cross. It was dedicated to the "Black Rood," a golden cruciform casket brought to Scotland by Queen Margaret about sixty years earlier, and supposed to contain a fragment of the true cross. The Black Rood was captured by the English in the battle of Neville's Cross (1346), and deposited in St. Cuthbert's shrine in Durham cathedral, whence it disappeared during the Reformation. The abbey church, much injured by fire during the English invasions in 1544 and 1547, but subsequently repaired, was converted into the parish church of the Canongate during the Reformation, and so remained until 1687, when it became the chapel-royal. It is now in a ruined condition. Holyrood Abbey was a frequent residence of the Scottish kings, even before the foundation of the royal palace in the reign of James IV. (about 1500). From that date to the accession of James VI. to the throne of England it was the principal abode of the Scottish sovereigns. It was almost completely

destroyed by Cromwell's troops in 1650, but was rebuilt by Charles II. Notwithstanding the numerous injuries it has undergone, a portion of the original structure of James IV. still remains. Amongst the historical scenes associated with the palace must be mentioned the murder of David Rizzio (1566), and the balls and assemblies held during the brief sovereignty of the Young Pretender, which took place in the picture gallery. The buildings and precincts of the palace continued to be a place of sanctuary for debtors till within a very recent period.

Holystone, a soft porous stone, used at sea for scouring decks. It is applied with sand and water.

Holy Water, water which has been consecrated to religious purposes through the blessing of a priest. Its use as a symbol of spiritual purification in the early Church was derived from the Jewish observance of washing the hands, but in all religions and at all periods the cleansing properties of water have given rise to the same or similar rites. We know from Tertullian that it was so used by Christians before the close of the 2nd century. The custom of mixing salt with the water arose at a very early period. The use of holy water is now an important feature in the services of the Roman Catholic, Greek, and Eastern Churches. It is placed in benitiers (q.v.) at the entrance to churches that the congregation may sprinkle themselves when passing in and out.

Homaloptera (PUPIPARA), a division of Diptera, the members of which are all parasitic. Such are *Hippobosca*, which lives on the horse; Bee-lice, which infest bees; and Sheep-ticks. *Ornithomyia* occurs on birds, while the family *Nycteribida* infests bats. One of the most interesting points in the group is the fact that the egg stage is suppressed, and the young are born directly as pupæ. These have long spreading legs, and resemble young spiders in appearance.

Homarus, the genus which includes the Lobster (q.v.).

Homberg Phosphorus, a fused mass of calcium chloride, CaCl_2 . If exposed to sunlight, it acquires the property of appearing luminous in the dark, and was called by the above name in honour of the first observer of this fact.

Homburg, or HOMBURG VON DER HÖHE, a Prussian town in the province of Hesse-Nassau, nine miles N.N.W. of Frankfort. It is a favourite health-resort, owing to its five saline and chalybeate springs, which are very efficacious in cases of dyspepsia, gout, rheumatism, skin diseases, and other complaints.

Home, DANIEL DUNGLAS (1833-86), a celebrated spiritualist, was born near Edinburgh. After making several distinguished converts in America, whither he had been taken at the age of nine, he came to London in 1855, and held *séances* which were patronised by Lord Brougham, Sir David Brewster, and other men eminent in politics.

letters, and science. During the next seventeen years he continued to display his skill in England, France, and Italy (where, in 1855, he became a Roman Catholic), but he was not a professional medium, and received no payment for his exhibitions. He died in Switzerland.

Home, JOHN (1722–1808), Scottish dramatist, was born at Leith and educated at Edinburgh University. In 1745, although already a probationer of the Kirk, he joined the royal army as a volunteer, and after the Jacobite victory at Falkirk was imprisoned in Doune Castle, from which he effected his escape. In 1747 he was appointed minister of Athelstaneford in East Lothian. His tragedy of *Douglas* was acted at Edinburgh amidst much enthusiasm in 1756, and, on its production at Covent Garden in the following year, won the approbation of Gray, Sheridan, and Hume. Home now resigned his living and came to London, where he continued to write for the stage. He was appointed private secretary to the Earl of Bute, and in 1760 received a royal pension of £300. In 1779 he settled in Edinburgh. His *History of the Rebellion of 1745* was published in 1802.

Homer. The earliest monuments of Greek literature are two epic poems, the *Iliad* and the *Odyssey*, which, up to a recent period, were universally ascribed to a single author named Homer.

Date, Place, and Circumstances of their Composition. The earliest known attempt to fix the date of Homer is that of Herodotus, who supposed him to have lived about 400 years before his own time, i.e. about 850 B.C. Later writers generally placed him a century or two centuries earlier. When Asia Minor had become the centre of Ionic culture, various cities on the east side of the Ægæan laid claim to Homer, but in the Homeric poems this region is still peopled by non-Hellenic races. The various "lives" of Homer are not older than the 2nd century A.D., and have no biographical value. Recourse must thus be had to the evidence furnished by the poems themselves. This is mainly of two kinds (1) historical and geographical, (2) linguistic. (1) The political and social institutions of the Homeric Achæans, their moral and religious ideas, art, industries, and military tactics, all point to a period earlier than the Dorian invasion, which is supposed to have taken place about 1100 or 1000 B.C. This conclusion is borne out by the latest excavations in Greece, Egypt, and elsewhere, which often illustrate passages in the *Iliad* and *Odyssey* and throw fresh light on their probable date. Many scholars now think that Homer may have lived in the 12th or 11th century B.C. (2) The dialect in which Homer writes is Old Ionic, with a considerable admixture of archaic forms, which otherwise appear only in Æolic and Doric. The differences between the Ionic of Homer and that of Herodotus and the earliest Attic writers shows that there must have been a long interval between the two periods. As the "Epic dialect" is likewise employed by the Boeotian Hesiod, it had evidently become the recognised language of literature, and its use by Homer does not prove that he belonged to the Ionic stock. It is difficult

to form any idea as to the personality of the author of the *Iliad* and *Odyssey*, or the circumstances under which he wrote. He can hardly have belonged to the same class as the *rhapsodes* ("stitchers of songs"), reciters of epic poetry, who in a later age competed at great festivals, such as the Panathenæa. No grounds can be adduced for supposing that he was a wandering minstrel. The most probable view seems to be that, like his own Demodocus, he was a bard residing at a royal court, but one whose literary character was more distinctly recognised, who exercised higher functions than the casual entertainment of the royal household.

The Homeric Question. A sceptical view of the authorship of the *Iliad* and *Odyssey* grew up gradually during the 18th century. One of the first to maintain that they were collections of loose lays was the Abbé d'Aubignac, whose *Conjectures* were published in 1715. The question whether Homer could write had already been discussed by Casaubon and Perizonius in the 16th and 17th centuries. The contrary opinion, based on a passage in Josephus (90 A.D.), was maintained by Robert Wood in his *Essay on the Original Genius and Writings of Homer* (1775). The reaction in favour of "nature" as opposed to "art"—i.e. to the artificiality of the 18th century—drew the attention of literary men to popular and unwritten forms of poetry: the border-ballads were assiduously studied, and the appearance of Macpherson's *Ossian* (1760–65) suggested the notion that the *Iliad* and *Odyssey* might be compilations of the same character. At the same time, the publication of the Venice MS. (1788), which brought to light the labours of the Alexandrian critics, furnished material for a critical examination of the Homeric text. The original purpose of Wolf's *Prolegomena* (1795) was to ascertain the extent to which the Homeric poems, as we now possess them, have retained their integrity of form. But he was soon led to discuss the larger issues involved, and in doing so he displayed a thoroughly sceptical spirit. The Homeric question is extremely intricate; it will be possible only to indicate briefly the main points in Wolf's arguments and the answers they have received from modern critics. Wolf maintains that (1) writing was unknown during the period assigned to Homer. But it is incredible that a complete epic like the *Iliad* or *Odyssey* should have been produced without its aid. (2) They must therefore have consisted originally of independent lays, which were handed down orally. The means of transmission is found in the rhapsodes, mentioned by ancient authors. The Homeridæ are described as a school of rhapsodes charged with the preservation of the Homeric poems. Wolf maintains that the rhapsodes altered and extended the older lays, thus producing a cycle of poetry which dealt with the siege of Troy and the story of Odysseus. (3) The "Voice of Antiquity" is unanimous in asserting that the lays were collected and written down by the command of Pisistratus, Tyrant of Athens, in the 6th century B.C. (4) Their form, however, was not thereby settled, for numerous changes were introduced by

the *diaskeuasts*, or literary "polishers" of the next generation. (5) As MSS. multiplied, various readings arose, and amongst these the Alexandrian critics selected those which accorded best with their canons of literary criticism. At the same time they excised passages repugnant to their taste and welded the remainder into an organic whole. Thus it is to the grammarians Aristophanes and Aristarchus that we owe the *Iliad* and *Odyssey* in their present form. The progress of criticism and archaeological research have brought discredit on the speculations of Wolf. His arguments are now met by the following contentions: (1) The Greeks early came into contact with the Phœnicians, who possessed an alphabet at a very remote period. The gradual changes observable in the oldest Greek inscriptions, which belong to the 7th and 6th centuries B.C., authorise the belief that the introduction of the Phœnician alphabet took place at a much earlier date. It is unreasonable to suppose with Wolf that, when known, its use was confined to brief inscriptions. He is wrong in supposing that the Greeks possessed no materials available for a lengthy composition, and it is more probable that the didactic poems of Hesiod and contemporary works of a like character were written than that writing came into use with the growth of a prose literature in the 6th century. Finally in the *Iliad* itself Bellerophon carries a missive which may possibly have been a written letter. (2) Our knowledge of the rhapsodes is too slight to support the theory of Wolf. Colleges have existed among various peoples for the purpose of transmitting sacred hymns, but we cannot suppose that the "lays" possessed this sacred character. It is doubtful whether the Homeridæ of Chios had anything to do with Homer, while, on the other hand, the word is used by Attic writers to denote all "who busy themselves with Homer," and not any particular guild or clan. Whether the rhapsodes composed the greater part of the *Iliad* and *Odyssey* themselves, as Wolf assumes, or merely handed them on to their successors, it is inconceivable that there ever existed an indefinite number of great poets who all wrote on the same theme in exactly the same style. (4) The "Voice of all Antiquity" consists of vague statements by Cicero, Pausanias, and later writers, and, moreover, they do not assert that he committed the poems to writing, but merely that he "collected" or "arranged" the "books of Homer" or "the separate songs." The same, or a similar task is ascribed on equally good authority to Solon, Hipparchus, and others. The tradition in its various forms has been traced to a literary exercise in the form of an epigram, which is certainly not older than the Alexandrian period. (4) The *diaskeuasts* were not literary "polishers," but interpolators of fictitious lines. The corruptions they introduced into the Homeric and other texts do not, however, seem to have been very extensive. (5) The scholia show that the differences between the MSS. were insignificant, and such knowledge as we possess concerning Aristarchus and his predecessors favours the view that they exercised extreme caution in their selection of readings and earnestly strove to recover the

genuine text. Wolf's speculations were carried further, though on somewhat different lines, by Gottfried Hermann (1832, 1840) and Lachmann (1837, 1841).

The "Separators." Two ancient grammarians who noticed a few trifling points in which the *Iliad* and *Odyssey* differed, rashly asserted that they were not written by the same author. They became known as *Chorizontes*, or "separators." Modern scholars have observed discrepancies of a more serious kind. To say nothing of divergences in mythology and legendary lore, the latter extending to the tale of Troy itself, the *Odyssey* shows a decided advance in moral sentiment and the views entertained of the relations between gods and men. The question remains whether these differences are sufficient to outweigh the uniformity of style which characterises the two poems. The most recent defence of Homer against the attacks of Wolf and his followers is Mr. Andrew Lang's scholarly work *Homer and the Epic* (1893).

Homily (Greek, "intercourse") was sometimes used to denote the instruction which a philosopher gave his followers in a colloquial form. It was adopted by the early Church in the sense of a practical exposition of some passage of Scripture, always more or less homely in character. The use of homilies may have been derived from the Jewish practice of expounding the Law and Prophets in the synagogue (*cf.* Acts xiii. 14-48, xvii. 2; Luke iv. 16-22). Originally the sermon (*logos*) differed from the homily as a discourse does from a commentary. In process of time it became customary to draw up collections of homilies by well-known writers for the use of those who were too ignorant or idle to prepare them for themselves. The use of specially-prepared volumes of this kind is prescribed by the Prayer Book in accordance with the ordinances of 1547 and 1559. It is to these particular homilies, now seldom if ever used, that the name has become confined.

Homo-catechol, or HOMOPYRO-CATECHIN, $C_7H_8O_2$, is a benzene derivative consisting of *dioxytolnene*, $C_6H_3(CH_3)(OH)_2$. It is a syrupy liquid which is coloured green by chloride of iron. It is closely related to *creosol* [CREOSOTE], which is derived from it by the replacement of one hydrogen atom by the group CH_3 .

Homocercal. [FISHES, vol. iv. p. 305.]

Homocœla, a division of the calcareous sponges, including those in which the gastric cavity is lined throughout by collar cells. It includes the *Ascones*, *Homoderma* (q.v.), etc.

Homoderma, a remarkable calcareous sponge which grows from a tubular stolon or horizontal stem.

Homœopathy, derived from two Greek words, *homoios*, "like," and *pathos*, "a disease." The idea that diseases can be cured by the administration in appropriate doses of drugs which, when given to healthy persons in other doses, produce the disease or a morbid condition resembling the disease, is one which dates from the very earliest

days of the history of medicine. The notion that like cures like is based upon the undoubted fact that certain drugs produce widely differing results when administered in different doses. Thus digitalis when given in small quantities slows the pulse, while the same drug administered in large quantities produces the reverse effect. Again, the contrast in the effects produced by minute and by more considerable quantities of opium or alcohol upon the nerve centres may be cited as a case in point, and several other examples might be given. Early in the present century the doctrine embodied in the phrase "*similia similibus curantur*" was made popular by a German physician, Hahnemann. The system of treatment introduced by him was based upon the assumption that the principle like cures like was capable of a wide general application, and he was led to a belief in the efficacy of extremely minute doses of drugs in the cure of disease. A homœopathic pharmacopœia soon obtained a definite form, and schools of homœopathy acquired some celebrity in many parts of the world. The doctrine of infinitesimal doses, which was pushed to an extreme by Hahnemann, has been considerably modified by his successors, and the progress of knowledge with respect to the action of drugs has shown that Hahnemann's fundamental principle is by no means capable of being applied in the indiscriminate way which he advocated. While we recognise the absurdity of many of Hahnemann's notions, it must be admitted that he did something to stimulate the study of therapeutics, and it is claimed by homœopaths that their practice has been the means of demonstrating the usefulness of certain drugs, the merits of which would otherwise have been overlooked. In Germany and England homœopathy does not appear to be making much progress, but in the United States it still enjoys considerable popularity.

Homogeneity. This is a term of much general importance in physics. A substance is homogeneous when at all points the properties are exactly the same. Two equal cubes cut from different portions of the substance, with their corresponding edges parallel, would be identical in properties, and could conceivably be interchanged without altering the properties of the mass. Among homogeneous substances may be mentioned glass, water, rock-crystal, and gold. Such are further subdivided into *isotropic* and *æolotropic* substances. The former have the properties exactly the same in all directions; the above cubes could be interchanged in any new positions. Glass and water are isotropic. *Æolotropic* substances have the properties at any two points exactly the same in corresponding directions; the cubes must be interchanged in such a way as will not alter the aspects of their faces. Rock-crystal, selenite, and most other crystalline substances are examples of *æolotropic* bodies.

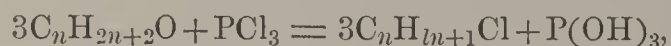
Homogeneous Atmosphere is a conception of some utility. A uniform and homogeneous atmosphere of height about 26,000 feet, and of density throughout equivalent to the present density of the actual atmosphere at the earth's surface, would give a pressure equal to the actually-existing

pressure. Such a state of things does not exist, the air reaching to a far greater height and diminishing continuously in density on account of the smaller pressure bearing upon it as the height is increased.

Homogeneous Light means light of one definite colour only, due to vibrations of one frequency. It is impossible to get pure homogeneous light, but it may be approached very closely with the sodium flame, the constituents of which are two colours in the yellow portion of the spectrum, very nearly of the same frequency. Mixed light may be rendered more nearly homogeneous by filtering away certain of its various ingredients by passing the light through some medium that will only transmit certain colours.

Homologous, a term used in zoology to signify that the two organs resemble one another in origin. Thus the wing of a bird and the arm of a man are homologous. Whereas the wings of a butterfly are analogous, and not homologous to that of a bird.

Homologous Series. Amongst organic compounds a number of series of compounds occur in which each member differs from the preceding by the group CH_2 . These compounds are then said to form a *homologous series*. As examples may be instanced: the hydrocarbons known as *paraffins*, CH_4 , C_2H_6 , C_3H_8 , etc.; the *alcohols*, CH_3O , $\text{C}_2\text{H}_5\text{O}$, $\text{C}_3\text{H}_7\text{O}$, etc.; the *fatty acids*, CO_2H , $\text{C}_2\text{H}_4\text{O}_2$, $\text{C}_3\text{H}_6\text{O}_2$, etc. A very large number of such series exist, and in all cases the members of the same series possess the same characteristic properties, and in their chemical behaviour closely resemble one another. A large number of chemical equations can thus be made general—*i.e.* applying to a whole series of compounds, and not to one single body only. The equation—



representing the formation of a chloride from an alcohol, is such a general equation. With this general similarity, too, there is a regular variation in properties as the series is ascended. Thus the boiling-points rise regularly, those of the first four alcohols being 66° , 78° , 98° , 117° , while in other series a similar variation is noticed.

Homoptera, the division of Rhynchota (q.v.) which includes all those in which the anterior pairs of wings are of the same texture throughout, as in the *Cicadidæ*, Lantern Flies, Plant Lice (*Aphides*), Scale Insects (*Coccidæ*), etc. The last of these is of great economic value, as the dried females of one species (*Coccus cacti*) forms cochineal, while another (*C. lacca*) yields shellac. As a rule, the members of this group are small and inconspicuous, but a few of the *Membracidæ* are fairly large, and resemble butterflies in general aspect.

Homotaxis, a similarity in the general succession of organic types in widely-separated regions, indicating that the strata containing these types have been deposited during the same relative periods in the geological series.

Honduras, a republic of Central America, extending over about 46,500 square miles, and bounded by the Bay of Honduras and the

Caribbean Sea on the N. and N.E., Guatemala on the W., and San Salvador and Nicaragua on the S. and S.E. It has a coast-line of 400 miles on the N. and 50 miles on the S., skirting the Gulf of Fonseca, between San Salvador and Nicaragua. The mean latitude is $14^{\circ} 35' N.$, longitude $86^{\circ} 18' W.$ The country along the sea-shore is swampy and malarious, but in the interior the surface consists of a succession of plateaux, and here the climate is very moderate. The Cordilleras cross the state in a series of almost parallel ranges, running from N.W. to S.E.; in many places the level surface between them becomes hollowed out into rich and well-watered valleys. Honduras was discovered by Columbus in 1502, and is said to owe its name (which in Spanish means "depths") to the difficulty he experienced in finding a place where he could anchor. There are numerous pyramids and other traces of the original inhabitants. The people of Honduras rebelled against Spain in 1821, and, after a temporary union with the other countries of Central America, formed themselves into a separate state in 1839. Since that time there have been several wars and revolutions. The Republic contains thirteen departments. By the constitution of 1880 the government consists of a President, chosen for four years, and assisted by six ministers and a Legislative Chamber composed of thirty-seven deputies, but the President practically exercises unlimited power. The country is now burdened with a heavy debt, mainly owing to the vast sums expended in the construction of an inter-oceanic railway and other public works. Agriculture is followed extensively, and, owing to the wide tracts of good pasture-land, cattle-rearing is a profitable branch of industry. Honduras is exceptionally rich in mineral products: gold, silver, iron, copper, platinum, mercury, antimony, zinc, and tin abound, and opals, emeralds, and other precious stones are found in large quantities; the former especially are famed for their beauty. It is only recently, however, that much has been done to develop the mineral wealth of the country, and this has been mainly due to the efforts of North American and other foreign companies. Most of the trade of Honduras is carried on with the United States, the chief exports being cattle, fruits, cotton, sugar, timber, indiarubber, and indigo.

Hone, WILLIAM (1780–1842), writer and bookseller, was born at Bath, and received from his father a severely religious training. During his residence in London and the neighbourhood, as an attorney's clerk (1790–1800), he abandoned the orthodox principles of his youth for those of the London Corresponding Society. In 1800 he set up as a bookseller in London, but he failed several times, nor did his name become generally known until he started the *Reformer's Register* (1817), a weekly periodical, in which he exhibited his talent for parody and lampoon. At the close of the same year he was prosecuted by the Attorney-General for publishing three political tracts—*The Late John Wilkes's Catechism*, *The Sincereurist's Creed*, and *The Political Litany*, a parody on parts of the Church Service, with illustrations by Cruikshank.

The able manner in which he conducted his defence led to his acquittal on all three counts. In 1819 appeared his *Political House that Jack Built*, but he subsequently abandoned politics for antiquarian research, publishing his *Every Day Book* (1826), *Table Book* (1827–28), and *Year Book* (1839), which abound in curious information. Towards the close of his life he became a pious member of a Dissenting congregation. Throughout his whole life Hone was never free from pecuniary embarrassment.

Honey is the saccharine liquid which is secreted by the honey-bee and certain other insects of the same genus. By these it is obtained from the nectaries of flowers, and deposited in the honey-comb. It varies somewhat in colour, consistency, and flavour, according to the different plants from which the bees obtained the supply. It consists of a mixture of different sugars known as *glucoses* (q.v.), with small quantities of cane sugar and non-saccharine material, while it usually contains water to the extent of about 25 per cent. The purest honey is known as "virgin honey," and is a clear yellowish liquid of density 1.44, which does not alter in the dark but slowly thickens and solidifies if exposed to light. Honey comes into commerce either in the comb, or as run honey, *i.e.* separated from the wax cells of the comb, either by heat, pressure, or other means. It is frequently adulterated with the mixture of starch and grape sugar, usually obtained from potato starch by the action of dilute acid. It has been known since very early times, and before the introduction of sugar was of much greater importance than at present. It is used in the preparation of sweetmeats, in dietary dainties, and in medicinal preparations, for which latter purposes it is always purified by warming and straining through flannel.

Honey Buzzard (*Pernis apicora*), called also the Bee Kite or Wasp Kite, a European bird, owing its latter names to its habit of taking the larvæ from the nests of bees and wasps—the first being apparently erroneous and having affinities with both kites and buzzards. The general coloration is brown, and the under surface is sometimes spotted with white. The food consists principally of wasp-grubs, though other larvæ and small animals are eaten. The Crested Honey Buzzard (*P. cristatus*) is a native of India.

Honey-eater, Honey-sucker, any bird of the Passerine family Meliphagidæ, confined to the Australian region, and characterised by their long, slender, curved bill and extensile tongue, ending in a bundle of filaments. There are twenty-three genera, with nearly two hundred species, living chiefly on nectar and insects. One of the best-known species is the Warty-faced Honey-eater (described by Gould), with brilliant black and yellow plumage. *Prothemadera novæ-zealandiæ*, about the size of a blackbird, with black plumage of metallic lustre, is a member of this family. The natives call it Tui, and Europeans the Parson-bird, from a tuft of white feathers on each side of the throat.

Honey-guide (INDICATOR), any bird of the genus *Indicator*, constituting the family *Indicatoridæ*, with affinities to the woodpeckers and barbets.

There are eleven species (some of them parasitic) from the Oriental and Ethiopian regions. They are of sober plumage, feeding on bees and sometimes on small birds. Their popular and generic names are due to the belief that they guide men to the nests of wild bees by a peculiar cry. The evidence for this belief seems conclusive.

Honeysuckle, the name applied in England to the genus *Lonicera*, of which there are three indigenous species. They are shrubs with simple, opposite leaves, a small five-toothed calyx, a monosymmetric bi-labiate corolla with reflexed lobes, four in the posterior and one forming the anterior lip, five stamens and a baccate fruit. *L. Periclymenum* is the common Honeysuckle, the Woodbine of Shakespeare, the twisted Eglantine of Milton and Tennyson. Other species are *L. Caprifolium* and *L. Xylosteum*.

Hongkong, an island in the south of China, which became a British possession in 1842, in accordance with the Treaty of Nanking. It is about 90 miles S. by E. of Canton, and has an area of 29 square miles, consisting for the most part of barren and desolate rocks, which rise in a precipitous ridge to a height of 1,800 feet. The direction in which it lies is from N.W. to S.E., and between it and the mainland the Straits of Ly-u-mun expand into a magnificent harbour, extending over ten square miles. Opposite the eastern extremity of the island is the peninsula of Kowloon, the southern portion of which is now included in the colony. Hongkong is the chief mart in the south of China, and one of the most important commercial towns in Eastern Asia. The principal import is opium, the chief exports tea and silk. There is also a considerable trade in cotton, sugar, flour, rice, woollens, earthenware, etc. The manufactures include sugar, rum, ropes, and shipping stores. The mean annual temperature is 75° F., and during the greater part of the year the climate is tolerably healthy. The government is carried on by a governor appointed by the Crown, in conjunction with an Executive and a Legislative Council. The island is one of the stations of Her Majesty's fleet. Victoria, the capital, is picturesquely situated on the north side of the island on the hills overlooking the harbour.

Honolulu, the capital of the Hawaii or Sandwich Islands, is situated on the southern coast of the island of Oahu. The convenience of the harbour—a lagoon about a mile in length, enclosed by a coral reef, which lies on one side an opening about 300 feet wide—caused it to be visited in the first instance by whalers, and subsequently by ocean steamers and traders, who here have the opportunity of obtaining water and stores. It has now become a commercial centre of some importance, the trade being mainly carried on by foreigners, especially Americans. The town is situated above the harbour, on a plain formed of coral, at the opening of a valley which descends from the mountains in the interior. It contains some handsome public buildings and many private houses in the European style, interspersed with gardens and orchards. The climate is dry, but very pleasant.

Honorius, FLAVIUS (384–423), succeeded his father Theodosius as Emperor of the West, while the eastern half of the empire fell to the share of his brother Arcadius. The attacks of the northern races were at first warded off by Stilicho (q.v.), but after his murder in 408 Rome was besieged and taken by the Visigoth Alaric (410). During the remainder of the reign there were frequent and manifold signs of the disruption which was soon to culminate in the Ostrogothic conquest.

Honorius I. (d. 638) became Bishop of Rome in 625 in succession to Boniface V. In consequence of his wavering attitude during the Monothelite controversy he was denounced as a heretic at the Council of Constantinople (680).

Honthorst, GERHARD VAN, called "GERARDO DALLE NOTTI" (1590–1656), Dutch painter, born at Utrecht, studied at Rome, where he was much influenced by the paintings of Caravaggio. He came to England in 1620, and again in 1628, and was patronised by Charles I. He excelled in depicting night scenes, generally illumined by the light of torches or candles.

Hood. The academical hood, originally a variety of the monk's cowl, is worn by members of universities and of colleges which possess the right of conferring degrees. The material and colour of the hood denote the university and degree of the wearer. Hoods are also worn by "literates" or clergy of the Church of England not members of a university, and several Anglican theological colleges have distinctive hoods.

Hood, the surname of a most distinguished family of naval officers, of whom the most celebrated are:—SIR SAMUEL, first Viscount Hood, who was born in 1724, and became a commander in 1754, and a captain in 1756. In command of the *Antelope*, 50, he drove ashore the *Aquilon*, 50, in 1757, and in command of the *Vestal* in 1759 he captured the *Bellone*. In April, 1781, he engaged the French off Martinique, in September following he was second in command in the action off the Chesapeake, and in 1782 he repulsed De Grasse at St. Kitts. In 1782 also, as second in command under Rodney, he took part in the total defeat of the French in the West Indies, and was in consequence raised to the Irish peerage. In 1787 he became a vice-admiral, and in 1793 was made commander-in-chief in the Mediterranean, where he took possession of Toulon and the large fleet lying there, reduced Corsica, and performed other great services. He became an admiral in 1794, and died in 1816.

SIR SAMUEL, a cousin of the above, was born in 1762, commanded the *Renard* in the action of April 12th, 1782, and was posted in 1784. He served in the reduction of Corsica, and was with Nelson at Teneriffe and at the Nile. In 1799 he expelled the French from Naples; in 1801 he commanded the *Venerable*, 74, in Sir James Saumarez's actions; and in 1803, as commodore in the West Indies, won a K.B. for the capture of Demerara, Essequibo, and Berbice. In 1807 he took possession of Madeira, and in 1808 he effected the destruction of the Russian *Serolod*, 74. He died in 1814.

ARTHUR WILLIAM ACLAND, grandson of Captain Alexander Hood, killed in command of the *Mars*, was born in 1824, served in the China War in 1857, was director of naval ordnance in 1869-74, and a Lord of the Admiralty in 1877-79, 1885-86, and 1886-89, and, after having retired as an admiral, was raised to the peerage in 1892 as Lord Hood of Avalon; so that the family possesses the unique honour of having gained three naval peerages.

Hood, THOMAS (1799-1845), poet and humorist, was the son of a London publisher. He was born in the Poultry, and was placed at the age of thirteen in a merchant's counting-house; but his health failing him, he was sent to his father's relations in Dundee, with whom he remained from 1815 to 1818. On his return to London he was apprenticed to his uncle, the engraver Sands, and afterwards to Le Keux, but this profession he was compelled to relinquish through ill-health. In 1821 he became sub-editor of the *London Magazine*, and through it formed the acquaintance of Charles Lamb, De Quincey, Hazlitt, and other eminent men of letters. Another colleague on the *London Magazine* was John Hamilton Reynolds, whose sister he married in 1824, and in conjunction with whom he wrote *Odes and Addresses to Great People* (1825). It was soon followed by the two series of *Whims and Oddities* (1826-27), as well as by *The Plea of the Midsummer Fairies* (1827) and other poems. For one year (1829-30) he edited the *Gem*, in which appeared several noteworthy poems, including some of Tennyson's and his own *Dream of Eugene Aram*. But—partly, perhaps, owing to the stress of poverty—he was induced to cultivate the humorous rather than the poetic side of his genius, and in 1830 he started the *Comic Annual*. Towards the end of 1834 his pecuniary embarrassments, which had become more pressing through the failure of a firm with which he was connected, forced him to remove to the Continent, but not before he had done his utmost to satisfy his creditors. During his stay at Coblenz (1835-37) and Ostend (1837-40) he was engaged, notwithstanding his constant ill-health, in the attempt to repay the money lent him by his publishers by means of his literary productions. To this period belong *Hood's Own* and *Up the Rhine*. Soon after his return to England in 1840 he settled at Finchley, where he remained until his death. From 1841 to 1843 he was editor of the *New Monthly Magazine*, in which appeared the characteristic effusion entitled *Miss Kilmansegg*. His pathetic lyric *The Song of the Shirt* was published in the Christmas number of *Punch* for 1843. In 1844 he started *Hood's Magazine*, but his shattered health broke down completely under the strain of overwork, and before the end of the year he became too weak to leave his bed. He died in the following May. His last days were cheered by the knowledge that a pension recently granted him by Sir Robert Peel would be continued to his widow. The range of Hood's literary gifts was extremely wide. With a fascinating wit and extraordinary skill in playing upon words, he united a rich humour and a rare power of exciting the deeper emotions through his keen sympathy with human frailty and suffering.

The last quality is especially conspicuous in his *Bridge of Sighs* and *Song of the Shirt*. It is perhaps owing to the strong hold his humorous and pathetic writings have taken of the English people that his more purely imaginative work—such as his poem of *Hero and Leander*—is now so little remembered.

Hooghly. 1. The most westerly of the branches into which the Ganges divides itself as it approaches its mouth, is formed by the union of the Bhagruttee and the Jellinghee. Reckoning from a point 64 miles above Calcutta, it has a course of about 145 miles to the Bay of Bengal. It often becomes silted up, and much loss is sometimes caused by the moving banks and quicksands. The bore is said sometimes to reach the height of 15 feet. 2. A town on the river Hooghly, 27 miles north of Calcutta. It has a college for the study of English and Asiatic literature.

Hook, THEODORE EDWARD (1788-1841), wit and novelist, was the son of James Hook, a musical composer. He was born in London, and educated at Harrow and Oxford. His *Soldier's Return*, a comic opera, acted when he was only sixteen, was followed by numerous melodramas and farces, which appeared in quick succession. At the same time he became a general favourite in London society owing to his wit and gaiety and his power of repartee and of improvisation in verse and music. In 1813 he was appointed accountant-general and treasurer of the Mauritius, but in consequence of the discovery of a deficiency of 62,000 dollars he was summoned home in 1818. As he was unable to give any account of the money, he was held responsible for its loss, and was imprisoned in the King's Bench from 1823 to 1825. In 1820 he became editor of *John Bull*, a Tory journal, which he conducted with much skill, though not always with very good taste. His novels—*Sayings and Doings* (a series of nine published in 1826-29), *Maxwell* (1830), *Gilbert Gurney* (1836), etc.—were all of them realistic representations of actual characters and events. He also wrote a *Life of Sir David Baird* (1832), and recast the *Memoirs of Michael Kelly*.

Hook, WALTER FARQUHAR (1798-1875), the nephew of Theodore Hook, was educated at Winchester and Oxford. He was vicar of Leeds from 1837 to 1859, when he became Dean of Chichester. Dean Hook belonged to the High Church party, and gave his support to the earlier numbers of the *Traacts for the Times*, but abandoned the movement when it seemed to him to show a Romanising tendency. He wrote *Lives of the Archbishops of Canterbury* (1860-76), a *Church Dictionary* (1842), etc.

Hookah, a kind of tobacco-pipe, used in Arabia, Turkey, India, and other Eastern countries, in which a water-bottle is introduced at the lower extremity of a long flexible stem, between it and the bowl. The smoke is cooled by passing through the water. Hookahs are often elaborately decorated.

Hooke, ROBERT (1635-1703), natural philosopher, was born at Freshwater in the Isle of Wight, and received his education at Westminster and Cambridge. He was appointed curator of experiments to the Royal Society in 1662, and

professor of geometry in Gresham College in 1665, and acted as secretary to the Royal Society from 1677 to 1682. Hooke possessed extraordinary mechanical skill, and was remarkably quick in discerning general principles, even when aided by very slender evidence. He to some extent anticipated Newton's theory of gravitation and other discoveries in natural philosophy, and made improvements in the microscope, telescope, and quadrant. His chief work was his *Micrographia* (1665).

Hooker, JOSEPH (1814-79), an American general, born in Massachusetts, was educated at West Point, and served with distinction in the Mexican War. After living for eight years in retirement he joined the Northern army in 1861, and was placed in command of a body of volunteers. In the Peninsular campaign he displayed conspicuous courage, earning for himself the title of "Fighting Joe." In January, 1863, he was appointed commander of the army of the Potomac; but, over-estimating the forces at his command, he made a rash attack on the Confederate troops under Lee and Jackson, and was defeated in two engagements near Chancellorsville (May 2-3). In consequence of his ill-success he was deprived of his command, but he distinguished himself on several subsequent occasions, and in 1865 was promoted to the rank of major-general. He retired from the army in 1868.

Hooker, RICHARD (1554-1600), author of the *Ecclesiastical Polity* ("the judicious Hooker"), was born in 1554. Bishop Jewel furnished him with the means of proceeding from Exeter grammar school to Oxford, where he entered Corpus Christi College in 1568. After Jewel's death in 1571 Hooker found a new patron in Edwin Sandys, Bishop of London, afterwards Archbishop of York, who placed his son under his charge. This youth and another pupil, George Cranmer, great-nephew of Archbishop Cranmer, always remained Hooker's chief friends. In 1581, soon after taking orders, he was appointed to preach the sermon at St. Paul's Cross. Whilst in London he lodged with a Mrs. Churchman, wife of a linendraper, who seems to have inveigled him into a marriage with her unprepossessing daughter. After holding for a short time the living of Drayton-Bauchamp in Buckinghamshire, Hooker was, through Whitgift's influence, appointed Master of the Temple in 1585 in preference to the under-reader Walter Travers. Travers, who was an extreme Calvinist, thought it incumbent on him to impugn the new Master's views in his own discourses, and a keen controversy ensued between them. This dispute led Hooker to inquire more carefully into the principles of Church government, and the result was his famous work, *The Laws of Ecclesiastical Polity*. In order to afford him more leisure for pursuing his studies he was, in 1591, appointed to the living of Boscombe in Wiltshire, whence he removed to Bishopsbourne, near Canterbury, in 1595. Here he died, and his body rests in the parish church. The general aim of the *Ecclesiastical Polity* is to furnish a philosophical basis for the Elizabethan system of Church government. Hence the author is led to inquire into the

nature of law in general, and to examine the sources from which it derives its binding force. This he does in a manner which is alike remarkable for the dignity and eloquence of the language, the severe precision of the argument, and the profound knowledge and philosophical insight which the writer displays. The best edition of the work is that of Keble (revised edition, 1888). Hooker's simple life and modest character are charmingly described in the biography of Izaak Walton, first published in 1665.

Hooker, SIR WILLIAM JACKSON, F.R.S., LL.D. (1785-1865), botanist, was born at Norwich. In early life he made scientific expeditions to Iceland (1809), and to France, Switzerland, and Northern Italy (1814). In 1815 he settled at Halesworth in Suffolk, whence he removed in 1820 to Glasgow as Regius Professor of Botany in the university. In 1841 he was appointed Director of the Royal Gardens, Kew, and during his tenure of the office converted them into a botanical establishment which has no rival in the world. His published works, which were very numerous, include *British Jungermanniæ* (1816), *Exotic Flora* (1823-7), and *British Flora* (1830-42). His son, **SIR JOSEPH DALTON HOOKER** (b. 1817), was born at Halesworth and educated at Glasgow. He took part in the scientific expedition of Sir James Clark Ross (1839-42), and by his observations on the flora of the Auckland Islands, New Zealand, and Tasmania, afterwards published in *Flora Antarctica*, added greatly to the knowledge of the distribution of plants. A popular account of his travels in India (1848-51) is given in his *Himalayan Journals* (1854), while *Flora Indica* and other botanical works record their scientific results. In 1855 he became assistant director of Kew Gardens, and held the office of director from 1865 to 1885. During these years he carried on the work which his father had begun, and under his management the gardens have been very greatly improved. As President of the British Association in 1868 he supported the views of Darwin regarding evolution. In 1871 he visited Morocco, and ascended the Great Atlas. He was President of the British Association from 1873 to 1878. His chief work was his *Genera Plantarum* (1862-76), written in conjunction with Mr. George Benthham.

Hooke's Law is that for any elastic substance that is stretched or compressed under the action of some external force, the *strain* or proportional extension or compression produced is a constant sub-multiple of the *stress* or intensity of the force producing deformation. The law only holds within the elastic limit; if the load is too great, a *permanent set* is the result, the stress is not proportional to the strain, and the substance when relieved of the stress will not return to its original dimensions. If a rod of sectional area a and length l be extended by an amount λ on the application of a total load W , then the stress or load-intensity is $\frac{W}{a}$, the strain is $\frac{\lambda}{l}$, and Hooke's

law states that within the elastic limit $\frac{W}{a} = k \frac{\lambda}{l}$

where k is a constant for each elastic material employed. It is, for example, about 29,000,000 lbs. per square inch for wrought-iron. This quantity k is known as the modulus of elasticity of the material. [MODULUS, ELASTICITY.]

Hooper, JOHN (d. 1555), English martyr, was born in Somersetshire. After leaving Oxford he entered a Cistercian monastery at Gloucester, and on the dissolution proceeded to London, where he became influenced by the writings of Zwingli and Bullinger. The Protestant views he now formed compelled him to flee to France in 1539, and, with but a slight interval, he remained abroad for the next ten years, residing at Zürich from 1547 to 1549. After his return to England he became a prominent leader of the advanced Protestant section, and was appointed Bishop of Gloucester in 1550 and of Worcester in 1552. On the accession of Mary he was sent to the Fleet, and after eighteen months' imprisonment tried and convicted of heresy. He was burnt at Gloucester, February 9, 1555.

Hoopoe, any bird of the genus *Upupa*, with six species, constituting the family Upupidae. They are semi-terrestrial birds allied to the Hornbills in structure, feeding on insects, and most abundant in the Ethiopian region, though they extend into Europe and Asia. *U. epops*, the common Hoopoe, was formerly British, but is now only a visitor. The male is about a foot long, with finely variegated plumage of white, buff, and black, with a very large erectile crest. The colours of the female are a little less intense than of her mate. The cry of the bird (*hoo-hoo-hoo*) seems to have given it its name in most languages.

Hop (*Humulus lupulus*), the only representative of a genus belonging to the Cannabinaceæ, the same group as the hemp, is a herbaceous perennial, producing annually several twining shoots, often 15 or 20 feet long. It twines contrarily to the hands of a clock, has a very rough surface, and bears opposite, stalked, 3- to 5-lobed, coarsely serrate leaves, resembling those of the vine, but with a rough surface. The male ("seeders") and female flowers are on distinct plants, but the latter only are cultivated. The female inflorescence is a catkin or *strobilus*, with large bracts, each having in its axil two flowers each with a bracteole. The ovary and base of the bracts are covered with a yellow powder consisting of minute glands containing wax and the bitter acid principle lupulin ($C_{32}H_{50}O_7$), to which hops owe their value. In brewing, hops clarify the beer, give it an agreeable bitter flavour, and render it capable of being kept by checking the acetous fermentation. Hops were first systematically grown for market in England in the 16th century. They are cultivated chiefly in Kent, Sussex, and Herefordshire.

Hope, SIR JAMES, naval officer, was born in 1808, and became a captain in 1830. He commanded the *Firebrand* in the expedition to the River Plate in 1844-45, and behaved with conspicuous gallantry at the battle of Obligado. During the Russian War he commanded the *Majestie*. He was made a rear-admiral in 1857, commanded in

China during the war in 1859-62, obtained a K.C.B. for the capture of Peking, and subsequently commanded-in-chief in the West Indies and at Portsmouth. He died an Admiral of the Fleet and G.C.B. in 1881.

Hope, THOMAS (1770?-1831), a celebrated traveller and virtuoso, author of *Household Furniture* (1805) and other works of the same kind. His chief contribution to literature, however, was a romance entitled *Anastatius: or, Memoirs of a Modern Greek* (1819), which at the time of its appearance was supposed to be the work of Lord Byron. His son, ALEXANDER JAMES BERESFORD HOPE (1820-87), a zealous defender of Church institutions and chief founder of St. Augustine's Missionary College, Canterbury, was Conservative member for Cambridge University from 1868 to 1887.

Hope's Apparatus is an instrument for showing the temperature of greatest density of water. It consists simply of a cylinder of water around the middle of which there is a belt-shaped hollow for the reception of a mixture of snow and salt. This mixture produces an intense cold, and so causes a lowering of temperature of the middle zones of the water in the cylinder. Inserted in the top and bottom of the cylinder are thermometers recording the varying values of top and bottom temperatures. The middle regions cooling, the water there becomes denser and sinks; we thus see the lower thermometer falling. This goes on till 4° C. is there reached, after which further cooling diminishes the density of the water and it rises. The result is that the upper thermometer falls to 4° C. and then lower till freezing-point is reached, the lower thermometer remaining at 4° C. till nearly all the water in the cylinder is frozen. [HEAT.]

Hopkins, JOHNS (1795-1873), a native of Maryland, United States, after making a fortune as a grocer, founded the Johns Hopkins University in Baltimore in 1873. Unlike most other American universities, this institution has devoted itself specially to forwarding original research and training investigators.

Hopkins, SAMUEL (1721-1803), American theologian, was born at Waterbury, Connecticut, and educated at Yale College. From 1743 to 1769 he was pastor of Housatonnuc in Massachusetts. The views expressed in his *System of Doctrines* (1793) differ in some respects from the ordinary Calvinistic theology, and have given rise to the growth of a separate school, who do not, however, form a distinct sect. He also wrote a life of Jonathan Edwards.

Hoploparia, a genus of lobsters (*Macrura*) common in the Chalk and Lower Greensand. Some of the species were very large.

Hoplophoridae. [GLYPTODON.]

Hopson, or HOPSONN, SIR THOMAS, English seaman, born in 1642 at Bonchurch, Isle of Wight, ran away to sea at an early age, and by 1672 found himself second lieutenant of the *Dreadnought*. He was made a captain in 1678, served in the *York* at the battle of Beachy Head, and soon afterwards

was appointed rear-admiral. With his flag in the *Breda* he was second in command of Sir George Rooke's unfortunate convoy to the Straits. He subsequently, as vice-admiral, commanded at the blockade of Dunkirk, and, in the second post, in Rooke's expedition to Cadiz and Vigo. At Vigo, in the *Torbay*, he led the van with great gallantry, and broke the boom under a frightful fire. His ship was so severely mauled that he had to transfer his flag to the *Monmouth*. He died in 1717. It is said that Hopson, when a boy, climbed from the mainyard of his own ship to the main-topgallant mast-head of an enemy's ship that was in action alongside, and hauled down her colours.

Horace (QUINTUS HORATIUS FLACCUS) (65-8 B.C.), Roman poet, was born near Venusia in the south of Italy, on December 8th, 65 B.C. From his father—a manumitted slave, who had been a tax-collector or an auctioneer and had devoted his savings to the purchase of a small estate—he received a better education than usually fell to the lot of members of his class. His studies at Rome were continued up to his eighteenth or nineteenth year. He then went to Athens to receive instruction in the higher branches of philosophy and rhetoric. Whilst at Athens, in the latter part of 44 B.C., he joined the army of Brutus, who was proprætor of Macedonia and had come to the city for the purpose of raising troops. He held a high command in the republican army at Philippi, and after that disastrous battle effected his return to Italy, where he escaped proscription at the hands of the Triumvirate, but was deprived of his property. A small post in the service of the State hardly gave him enough to live on, and he turned to literature as a means of increasing his income. His earlier productions were mostly satires, some directed against the vices of society, others against the foibles of individuals, and it was not till he began to write lyrics that the higher qualities of his genius became manifest. He now became the friend of Virgil, by whom he was introduced to his patron, the minister Mæcenas (about 38 B.C.). Mæcenas' gift of a farm amidst the Sabine hills placed him beyond the fear of want, and he was able to give himself up to a life of easy conviviality, alternating with rural pursuits, which was thoroughly in accordance with his tastes. By Mæcenas he was brought to the notice of Augustus, who is said to have offered him a position in the royal household, which he declined. As the author of the *Carmen Seculare*, written for the celebration of the Secular Games in 17 B.C., he occupied a public position of a more secure and honourable kind. His death took place on November 27 in the year 8 B.C.

The works of Horace, with the dates assigned to them by the best authorities, are—two books of *Satires*, of which the first appeared in 35, the second in 30 B.C.; the collection of lyrics called *Epodes* (about 30 B.C.); four books of *Odes*, of which the first three were published in 19 B.C.; the earlier *Epistles*, written about the same time; the *Carmen Seculare*, and the later *Epistles*, including the fragment of literary criticism entitled *Ars Poetica*.

The qualities which entitle Horace to rank among the poets of all time are his wide knowledge of men and things, his sympathy with the light and shades of life and character, and his exquisite literary skill. His artistic gifts are especially conspicuous in his *Odes*—a form of composition which he carried to the highest state of perfection—while his *Epistles* owe their charm to their worldly wisdom, their genial humour, and their easy but refined familiarity. Horace was an adherent of the Epicurean school of philosophy—he calls himself “a pig of the herd of Epicurus”—which taught that life is short and that men should make the most of it while they can. But this end is to be realised not by giving way to the violence of the passions, but by cultivating every innocent enjoyment, and thus producing a calm and happy temper of mind. Although the gaiety and carelessness which mark Horace's poetry may at first sight seem somewhat superficial, he by no means disregards the deep problems of life and destiny. Occasionally he shows a flash of insight into the deeper springs of feeling, and through the whole of his poetry there runs a note of regret for the shortness of life and the vanity of all human effort.

Horatii and Curiatii. According to an ancient Roman legend, the rival claims of Rome and Alba Longa, in the reign of Tullus Hostilius (q.v.), were settled by a combat between three brothers on each side, the Horatii representing Rome and the Curiatii Alba. After two of the Horatii had been slain, the survivor vanquished each of his antagonists in turn, and thus decided the contest in favour of Rome. As he was entering Rome on his return he encountered his sister, who was attached to one of the Curiatii, and reproached him bitterly with his death. Horatius was so enraged that he immediately stabbed his sister, and for this crime he was condemned to death by the *duumviri*. But the populace rescued him, and he afterwards became the conqueror of Alba Longa. He was said to have been the ancestor of the Horatius Cocles who defended the bridge at Rome during the attack of the Tuscan king, Lars Porsena.

Horehound, a name applied to several members of the order *Labiata*, especially *Marrubium vulgare*, the common or white horehound, and *Ballora nigra*, the black horehound. The former has a rhizome, and bears a branched shoot a foot high covered with a white, hoary felt of hair. The flowers are small, in dense sessile clusters, and whitish, with a 10-toothed calyx, flat bi-lobed upper lip to the corolla, and tri-lobed lower lip and short included stamens. The plant has an aromatic odour and a bitter taste, and has long been in popular use for the treatment of coughs.

Horizon. There are two distinct meanings to the term. The first is the visible horizon, and may be defined as the line where earth and sky meet. This is irregular on land, and may be broken up considerably by hills, etc. On the open sea the visible horizon is a circle, depending in magnitude on the height of the observer, and depressed below him by an amount also depending on his elevation. This depression is called the *dip* of the visible

horizon. The astronomical horizon signifies the great circle of the celestial sphere whose plane is at right angles to the line joining the zenith to the observer.

Horizon, ARTIFICIAL, is a basin of mercury protected so that its surface shall remain clean and unruffled. Celestial objects reflected from the surface of the mercury appear to the eye as though they were at as great a distance below the horizon as they are actually above it. On account of this fact, a knowledge of the actual position of the horizon may be dispensed with—a matter of much convenience on land.

Horn, a brass musical instrument resembling the trumpet. The "French" or hunting horn, out of which has grown the modern orchestral horn, consisted of a long slender tube gracefully curved in several concentric circles and terminating in a bell. The horn has a compass of about four octaves. Its open tones are harmonies of the natural tone of the tube. Since it has been used in orchestral music a method has been devised of varying its pitch by means of detachable crooks of different lengths, which are added to the tube so as to increase the length of the latter. The pitch can be further modified by means of the "tuning-crooks" or "tuning-slide." The method of producing close tones by placing the hand inside the bell was invented by Hampl of Dresden in 1770. Ventil or valves are now generally used for the rendering of rapid passages.

Horn, a general name for the weapons on the heads of ruminants and rhinoceroses, and for the analogous structures in beetles. Thus used, it includes antlers (q.v.), but, properly speaking, the name is confined to the head-growths in the Cavicornia (oxen, sheep, and antelopes) and rhinoceroses. It is also employed to designate the epidermic tissue of which these structures are composed. Horns in the Cavicornia are borne on bony outgrowths (horn-cores) from the frontal bone and, except in the prong-horn (q.v.), are unbranched and persistent. The Chikara (q.v.) alone of living species has two pairs, as had the extinct Brama-therium and Sivatherium from the Siwalik hills, the posterior pair being branched. Unlike antlers, true horns are generally present in both sexes. The "horn" of the rhinoceros, which is supported on the nasal bones—the second horn, when present being on the frontal—is really a gigantic wart, composed of horny fibres growing from papillæ on the skin and cemented together by cells that grow up from between these papillæ. It takes a fine polish, and is fashioned into drinking cups, handles for tools, etc. Thin plates of horn were used in windows before glass was common, and down to recent times for lanterns, probably as less liable to breakage.

Horn, CAPE, a precipitous, bare, and jagged headland on Hermit Island, in the Fuegian Archipelago, is the most southerly point of America. It was called "Hoorn" by the discoverer, Schouten (1616), a native of the town of that name in Holland.

Hornbeam, CARPINUS, a small genus of deciduous trees belonging to the order Corylaceæ.

C. betulus, the common hornbeam, our only native species, has smooth light grey bark, which with its foliage resembles those of the beech; but the leaves are pointed and duller. Its timber is dense, white, and tough, giving its name to the tree. It is used for wooden mill-cogs, and furnishes excellent fuel and gunpowder charcoal. American species, *C. americana*, is known as iron-wood, blue beech, or water beech.

Hornbill, any bird of the Picarian family Bucerotidæ, with twelve genera, containing fifty species, from the Oriental, Ethiopian, and Australian regions. They are for the most part large birds, with enormous bills, and in some cases crests or helmets, with some outward resemblance to, but no close relationship with, the Toucans of the New World. They are chiefly fruit-eaters. The male plasters up his mate in her nest, feeding her and her young till nearly full grown, through a small slit left for the purpose.

Hornblende, or AMPHIBOLE, a group of mineral silicates of magnesium and calcium, the former predominating, with occasionally iron, aluminium, sodium, or other metals. *Hornblende*, the black aluminous variety, occurs in syenite, syenitic granite, diorite, and some andesites and trachytes. *Actinolite*, a bright green form, occurs in needles, fibres, and narrow crystals in hornblende-schists and amphibolites. *Nephrite*, another green form, forms the hard tough substance known as *jade* (q.v.). *Asbestos* (q.v.) is a fibrous white variety.

Horn-book, a leaf of vellum, formerly used in teaching children to read and count. The leaf was covered with a sheet of transparent horn, and enclosed in a wooden frame with a handle for the child to grasp. On the vellum were written the alphabet, the Roman numerals, the Lord's Prayer, and sometimes a few short words. At a later date the leaves were made of paper and printed, and in this form they remained in use till the middle of the 18th century.

Hornby, SIR PHIPPS, naval officer, born in 1785, served with Nelson and on shore at the defence of Gaeta, and was made a commander in 1806 and a captain in 1810. He greatly distinguished himself in the defence of Sicily, and more especially in Hoste's victory off Lissa, in which he was wounded. After attaining flag-rank in 1846, he was controller-general of the Coastguard and commander-in-chief in the Pacific, with his flag in the *Asia*. He died an admiral in 1867. His son, SIR GEOFFREY THOMAS PHIPPS HORNBY, born in 1825, became a captain in 1852, and attained flag-rank in 1869. He early gained extraordinary reputation as a tactician, and, after holding minor commands, was commander-in-chief in the Mediterranean, a lord of the Admiralty, commander-in-chief at Portsmouth 1882-85, and commander of the Particular Service Squadron 1885.

Horne, RICHARD HENRY (1803-84), poet and dramatist, was born in London. After serving in the Mexican navy in the war against Spain, he settled in London as a literary man, and in 1828

contributed to the *Athenæum* a poem called *Hecatompyles*. His epic *Orion* (1843) was published at the price of one farthing. In 1844 appeared *A New Spirit of the Age*, a volume of critical essays written in conjunction with Mrs. Browning and Robert Bell. The years 1852-69 were passed in Australia, where he held numerous posts, chiefly in connection with the gold-fields. Horne's literary merits, which are incontestable, have never been recognised by the general public. Even *Orion* is little read, and his numerous other works are almost completely forgotten.

Horned Screamer. [SCREAMER.]

Horned Toad, Frog, or Lizard (*Phrynosoma cornutum*), a South American Agamid lizard. The head is toad-like and spinous.

Horned Viper. [CERASTES.]

Horner, FRANCIS (1778-1817), political economist, was born and educated in Edinburgh. He came to London in 1802, and in 1806 entered Parliament as a Whig. It was mainly through his efforts as chairman of the Bullion Committee of 1810 that payment in cash was resumed and the evils of an inconvertible paper currency checked.

Hornet, a large wasp (q.v.) which may be distinguished from the smaller British species by its reddish colour and a series of red spots along each side of the abdomen. It lives in small communities in the south of England and on the Continent. It usually builds its nest in trees or in thatched roofs.

Horny Sponges, or KERATOSA, the division of sponges including the common sponges of commerce. They belong to the division *Noncalcarea*, from which they differ in the absence of spicules and the presence of numerous fibres of "spongin" or "keratose" which compose the sponge. [SPONGE.]

Horology. [CLOCKS, WATCHMAKING.]

Horrocks, JEREMIAH (1617?-1641), astronomer, was born at Toxteth Park, near Liverpool, and educated at Cambridge. In 1639 he accepted the curacy of Hoole, Lancashire, where he made his famous observation of the transit of Venus across the sun, recorded in *Venus in Sole Visa*, which was published by Hevelius at Danzig in 1662. His theory of lunar motion is commended by Newton. His early death was a great loss to science.

Horse, a book-name for any species or individual of the family Equidæ, belonging to the Perissodactyle (or odd-toed) Ungulates, and equivalent to the lapsed order Solidungula or Solipedia (a name which in a slightly different form goes back to the days of Pliny). All the living and the later fossil forms are characterised by the possession of a single perfect digit, enclosed in a broad hoof, on each limb. Modern systematists recognise but a single genus *Equus*, but Gray founded his genus *Asinus* for the Asses, while Smith placed the Zebras and the Quagga in a third, *Hippotigris*, the name by which the striped forms were known to the Romans.

There are generally said to be twelve species of

the genus *Equus*. These may be conveniently distributed into two groups, the latter of which is again divided.

A. THE CABALLINE GROUP :—TRUE HORSES.

1. *Equus caballus* (the Domestic Horse).
2. ? *E. przewalskii* (Prejevalsky's Horse).

B. THE ASININE GROUP.

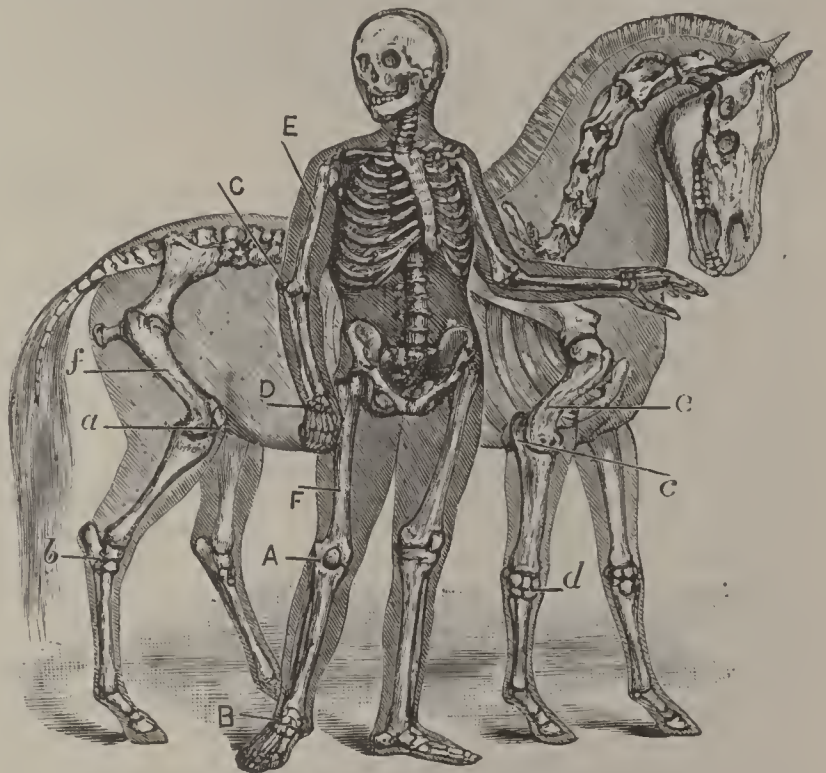
(a) Of Uniform Coloration :—True Asses.

3. *E. asinus* (the Domestic Ass).
4. *E. hemionus* (the Kiang or Dziggetai).
5. *E. onager* (the Onager).
6. *E. hemippus* (the Syrian Wild Ass).
7. *E. taniopus* (the African Wild Ass).

(b) Striped :—Zebras.

8. *E. zebra* (the Zebra).
9. *E. burchelli* (the Dauw, or Burchell's Zebra)
10. *E. chapmani* (Chapman's Zebra).
11. *E. grevyi* (Grevy's Zebra).
12. *E. quagga* (the Quagga, ? extinct).

It is, however, certain that all are not entitled to specific rank. Leaving No. 2 for the present, there



SKELETON OF MAN AND HORSE.

A. Knee (stifle of horse). B. Ankle-joint (hock). C. Elbow-joint. D. Wrist (knee of horse). E. Humerus, bone of upper arm. F. Femur, or thigh-bone.

are grounds for believing that No. 3 and No. 7 are very closely allied, if not identical, and that No. 5 and No. 6 are but sub-species or varieties of No. 4. No. 10 is a sub-species of No. 9, so that, according to Sir William Flower, "there are at least seven modifications of the horse-type, at present, or very recently existing, sufficiently distinct to be reckoned as species by all zoologists, and easily recognised by their external characters." [ASS, QUAGGA, ZEBRA.]

The horse (*E. caballus*) is distinguished from all other members of the genus by its flowing mane and tail, the latter covered with hair from the root, arched neck, well-formed head, large rounded hoofs, and a wart or callosity on the inner side of each hind limb, just below the ankle joint (the hock), in addition to that on the inner side of each fore limb, just above the carpal joint (the so-called

“knee”), common to all the genus. These “chestnuts” or “mallenders” are normal growths, existing in both sexes at birth, but their origin and function are unknown. The dental formula is $I \frac{3}{3} C \frac{1}{1} PM \frac{4}{4} M \frac{3}{3} = 44$. The first premolar is rudimentary, and the canines or “tushes” are generally present only in the males. The incisors are disposed in a semicircle. In the crown is a pit surrounded by a ring of enamel, which with the outer layer forms the “mark” by which the age of a horse is ascertained. When by use the tooth is worn away below the pit the inner ring disappears, and the horse is said “to be out of mark or ‘past mark of mouth.’” This takes place in the eighth or ninth year. The incisors are separated by a short interval from the canines, and these from the premolars by a greater, technically known as the diastema, and popularly as the “bar,” of great importance as affording space for the bit, by which the animal is governed. The grinding teeth are marked by complex crescentic folds of enamel, and the outer spaces are filled with a thick coating of cement. The orbit is surrounded by a bony ring, and the upper lip is prehensile. The hoof with its enclosed bone corresponds to the last phalanx or joint of the third digit with its nail in man, and the plantar cushion or under part of the hoof to the soft padlike end of the digit. The metacarpal and metatarsal bones of the last second and fourth digits are present in the form of splints.

The horse figures on Egyptian monuments both as drawing chariots and carrying armed men, and from Scripture it is clear that the Hebrews derived their horses from Egypt. Of the classic passage in Job (xxxix. 19–25), Borrow says—“Who that has ever seen a blood stallion excited by the din of a fair or a battle and heard him to distinctly neigh ha! ha! can doubt that the author of Job painted an Oriental war-horse from life?” The presence of the wild horse in Europe goes back to Neolithic times, when it was a beast of chase. In the Bronze Age, however, horses were employed for riding, as is shown by the bronze bits discovered in France and Italy. The ancient Greeks at first used the horse to draw chariots, and it was not till about 500 B.C. that they employed it as a beast of burden. Cavalry played an important part in the early Roman wars, and under the later kings the horse was utilised for burden and draught. Virgil in his third *Georgic* gives rules for breeding and training, some of which, as to kind treatment, might be advantageously impressed on horse-breakers of our own day. The Britons had cavalry and war-chariots when Cæsar landed (*de Bell. Gall.* iv. 26). In the reign of Athelstan horses were imported from Germany and Spain to improve the native breed. After the Conquest, William I. paid great attention to the native horses, and John imported Flanders stallions, to which the strength and stamina of English horses is in great measure due. During the Crusades there must have been a considerable infusion of Arab blood, and from Edward III. English sovereigns did much to improve the native breed by crossing English horses with those imported from Spain, the descendants of Arabs introduced into the Peninsula by the Moors.

King James I. paid £154 for a small bay Arab horse—the Markham Arab, with £11 “to the man that brought him,” and from that time Arab blood was mixed with that of the English strain (Godolphin Arab and Byerley Turk are the most famous), and the pedigree of “Derby and St. Leger winners may invariably be traced to one of the Oriental sires of the seventeenth century recorded by Mr. Weatherby” in the fourth edition of his *Stud Book*.

The *racehorse* generally stands from $15\frac{1}{2}$ to 16 hands high. (The hand equals 4 inches, and measurements are taken at the withers.) The colour is usually some shade of chestnut or bay, rarely black or roan, and scarcely ever grey. The more length and size there is, on short legs, the better, with a well-shaped head, full nostrils, with a strong deep neck running imperceptibly into the shoulders. The hips should be deep and round, with little space between them and the back ribs. This will give freedom of action, propelling power, and fine stride.

Racehorses that do badly in training are often sold for *hunters* and *steeplechasers*, though generally these horses are not thoroughbred. “In the gallop the steeplechaser should be a dashing, savage goer, bending his knees well. The racehorse should glide along with a straight reach, as smoothly as a cutter through water.” The withers should be high, and the shoulders long, that the horse may rise well at his fences, and the hip and pelvis broad, with light back ribs and a loose flank that he may dash his haunches under him at a big jump.

A charger should be stout, well-built, and $15\frac{3}{4}$ or 16 hands high, for a cavalryman with his accoutrements rides from 18 to 22 stones. The military seat differs from that of the hunting man in that the soldier rides with longer stirrups, and the recruit in the riding school is taught to maintain his position by grip, and to govern his horse chiefly by pressure of the legs.

Carriage and coach horses for state functions and the Park may be as much as 17 hands high, and are either thoroughbred or have a large infusion of blood. Animals of this character fetch a high price, especially when matched in teams or pairs. For ordinary carriage work about 15 hands is the usual height.

The cart-horse is a distinct breed, adapted for drawing heavy weights at a walk. It was introduced by the Dutchmen who followed William III. to England, and set to work to drain the Fens. In the early part of this century there were some half-dozen different breeds, but the old Cleveland Bay is now nearly if not quite extinct, and the Clydesdales and the Suffolks are in the highest repute. The largest cart-horses are those used by brewers and railway companies.

A pony is a horse that does not reach 13 hands, though the term is often loosely applied to any small horse. The chief British breeds are those of Shetland and Exmoor and Dartmoor, some specimens of which do not exceed 9 hands. Large numbers of Welsh ponies are used, and the New Forest ponies are locally known as heath-croppers.

The senses of the horse are very acute, and its intelligence great. Its skin is highly sensitive,

and it has what in men is called the nervous temperament. It is also capable of a high degree of training, and seems to enjoy the performance of complicated evolutions, as may be seen in the musical rides at the Military Tournament held in London every year.

The utility of the horse to man can scarcely be overrated. Not only is it a valuable servant while living, when dead its hide furnishes leather, the bones are ground for manure, the intestines are made into catgut, glue is manufactured from the hoofs, and the hair of the mane and tail is woven into haircloth or used for stuffing mattresses, etc. In France horseflesh is largely eaten, and it is said that much of it is sold in Paris for beef. If exposed for sale in England, the fact must be notified on the shop or stall in letters not less than four inches long.

The entire horse is called a *stallion*, and the female a *mare*; the young is a *foal*, if a male a *colt*, if a female a *filly*. The mare breeds at three years old, is served by the stallion in the early summer, and carries her single foal eleven months.

According to Darwin, the horse is probably descended from "a single dun-coloured, more or less striped, primitive stock, to which our horses still occasionally revert," and "aboriginally must have inhabited countries annually covered with snow, for he long retains the instinct of scraping away to get at the herbage beneath." But this "primitive stock" has long ago disappeared, and the herds of so-called "wild horses" of Tartary known as Tarpan, in America as Cimarrones or Mustangs, are certainly feral, that is, the descendants of animals escaped from domestication.

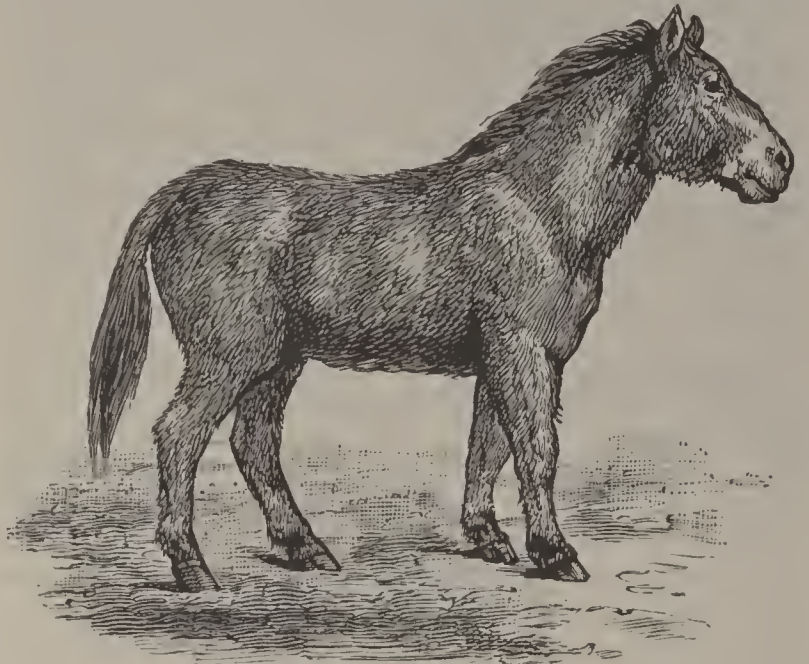
Whether Prejevalsky's Horse (*E. przewalskii*) is a good species is an open question. See Grijimailo in the *Proceedings of the Royal Geographical Society* (April, 1891).

Sir William Flower (*The Horse*, p. 79) thus summarises the description of the animal by Poliakov, who established the species:—

"It has callosities on all four limbs, as in the horse, but only the lower half of the tail is covered with long hairs, as in the ass. The general colour is dun, with a yellowish tinge on the back, becoming lighter towards the flanks, and almost white under the belly, and there is no dark dorsal stripe. The mane is dark brown, short, and erect, and there is no forelock. The hair is long and wavy on the head, cheeks, and jaws. The skull and the hoofs are described as being more like those of the horse than the ass. Until" (he adds) "more specimens are obtained, it is difficult to form a definite opinion as to the validity of this species, or to resist the suspicion that it may not be an accidental hybrid between the kiang (*E. hemionus*) and the horse." However, J. A. Thomson (*Outlines of Zoology*, p. 581) accepts it as a valid species.

The horse in its modern form dates back to Pleistocene times, but its evolution may be traced to a more remote period, through Pliocene forms in which the second and fourth digits of the fore limb were more or less rudimentary, and the Miocene Miohippus or Anchitherium and Meshippus with three digits, or three and a rudiment, to

Hyracotherium, with four functional digits, and back to Phenacodus with five digits on each foot. This animal, from the Wasatch Eocene of N. America, stands in the direct line of the ancestry of Artiodactyle as well of Perissodactyle Ungulates. (Nicholson



PREJEVALSKY'S HORSE.

and Lydekker: *Palaeontology*.) With regard to the "home" of the horse, Lydekker thinks that, as a series of identical or closely-allied forms are found in the Tertiaries of Europe and America, a parallel development has simultaneously taken place, and he supports his opinion by the fact that the Indian living dogs are derived from the Pliocene form of the same region, and Brazilian dogs from dogs of the Cave epoch of South America. Professor Cope believes that Protohippus in the West and Hipparion in the East was the immediate ancestor of the genus Equus.

Horse, MASTER OF THE, an officer in the royal household, whose duty it is to superintend the Queen's stables and horses. The appointment becomes vacant with every change of Government.

Horse-chestnut, the popular name of a genus of trees belonging to the order *Sapindaceae*, probably derived from the resemblance of their seeds to the fruits of the true or sweet chestnut, a totally distinct tree, whilst this is inedible—"horse" being a contemptuous prefix signifying "coarse," as in horse-radish, or as the "dog" in "dog-violet." They have smooth bark; opposite, exstipulate, palmate leaves of 5 to 9 leaflets; a five-lobed calyx; 4 to 5 petals; 5 to 8 stamens; and a three-chambered single-styled ovary, which forms a leathery dehiscent capsule containing several large exalbuminous seeds. The common horse-chestnut, *Æsculus Hippocastaneum*, is not certainly known in a wild state. It grows 50 or 60 feet high, with branches which ascend and then curve downwards and outwards, and very large buds, which are very glutinous in spring. There are typically 7 obovate-cuneate leaflets, which are somewhat exceptional in hanging downwards in the bud and rising as they expand. The inflorescence is a conspicuous pyramidal raceme of cymes, terminating a branch:

the petals are white, flecked with pink and yellow ; and the stamens are generally of the exceptional number seven, two being intercalated between the normal five. Only the lower flowers produce fruit, the upper ones being staminate. The fruit is spinous, and the six ovules only give rise to one, two, or three of the dark-brown seeds. The soft white wood is of little use. The "nuts" are too bitter for human food, but are eaten by goats and deer. Pure starch can be prepared from them, and, when mixed with twice the quantity of wheat-flour, they afford a strong bookbinder's paste. Several species are natives of North America, where they are known as Buck-eyes, some of them having yellow, pink, or scarlet blossoms.

Horse Mackerel, a book-name for fishes of the Acanthopterygian family Carangidæ, from tropical and temperate regions. The type-genus *Caranx*, with about 90 species, has the body more or less compressed, and the lateral line entirely or partially covered with plate-like scales. *C. trachurus*, the Common Horse Mackerel, about a foot long, is common round the English coasts, and is sometimes eaten, but its flavour is far inferior to that of the mackerel (q.v.).

Horse-power is the engineer's unit of power, or rate of doing work. From certain experiments made some years ago it was settled that the horse-power should be regarded as equivalent to 33,000 foot-pounds of energy performed per minute. Nevertheless, it requires an exceptional horse to supply energy at that rate for any considerable time, and the unit should therefore be regarded as quite arbitrary. Small engines are estimated by man-power, which is from 2,600 to 3,100 foot-pounds per minute. Indicated horse-power, or I.H.P. of a steam-engine signifies the power supplied by the steam that is actually passed into the cylinders. This is calculated from indicator observations of the changing pressure of steam throughout the stroke and of the number of strokes per minute. It is greater than the actual horse-power supplied by the engine for external use, there being waste in friction, etc., in the engine itself. The efficient power is called the brake H.P., which is invariably less than the I.H.P. of the same engine.

Horse-racing, especially in the form of chariot-racing, was a favourite sport amongst the ancient Greeks. It is mentioned in the *Iliad*, and formed a prominent feature both of the great national games and the local festivals. It was one of the chief performances which took place in the Roman circus (q.v.). Amongst the primitive Teutonic tribes it appears to have been connected with certain religious observances. Horse-races were held at Smithfield in the 12th century, and the Chester races date back to 1512. It was mainly owing to the patronage of James I. that horse-racing became a national sport in England. Much care was now expended on the training of horses and the instruction of jockeys. The prize at this time was usually a small ball or bell of gold or silver. Races took place at Newmarket in 1605,

and had become regularly established there in 1640. The races on Epsom Downs, then called Banstead Downs, were also established in the early part of the 17th century. Towards the middle of the century gold and silver cups came into vogue as prizes instead of bells. The sport continued to flourish under royal patronage, especially that of Queen Anne, who, besides instituting several plates, entered and ran horses in her own name. In her reign the Doncaster races were established (1703). A famous racer of this period was Flying Childers, who in or about 1721 ran 3 m. 4 f. 93 y. at Newmarket in 6 m. 40 s. The three great races for three-year-olds, the St. Leger, Oaks, and Derby (q.v.), were instituted in 1776, 1779, and 1780: the first (at Doncaster) by Colonel St. Leger, the two latter (at Epsom) by the twelfth Earl of Derby. The Oaks Stakes were so called from a seat of the Earl at Woodmansterne. As these two races take place in May or early June, whilst those at Doncaster are held in September, the winners of the two earlier stakes are brought into competition in the race for the St. Leger. The Ascot races, held on Ascot Heath, near Windsor, were established by the Duke of Cumberland, son of George II. They have always remained under the special patronage of the Royal Family, and occupy a very important place in the calendar of fashion. The Goodwood meeting, which dates from 1802, is held in July on the downs adjoining Goodwood Park, the seat of the Duke of Richmond, near Chichester.

Early in the history of horse-racing the "weight-for-age" principle was introduced, according to which the weight borne by each horse was proportioned to his age. But it was found that the reputation gained by the fleetier horses prevented competition, and "handicapping" was substituted. Under this system a greater or less weight is assigned to a horse according to his known or presumed powers, but it is very doubtful whether the result is really to place the competitors on the same level. Two-year-olds are not admitted to handicaps; like the three-year-olds they have races of their own, the most important being the Middle Park Plate, called the "two-year-old Derby," at the Newmarket Second October meeting. The chief handicap races are the Goodwood and Ascot Stakes, the Chester, Ascot, Goodwood, and Manchester Cups, the three Liverpool Cups, the Northumberland Plate, the Czarewitch and Cambridgeshire at Newmarket, the Great Ebor at York, the City and Suburban at Epsom, and the Lincoln Handicap. The Two Thousand and One Thousand Guineas for three-year-olds at Newmarket are run on the same terms as the Derby, Oaks, and St. Leger, for which they are preparatory—*i.e.* the horses carry equal weights, 8st. 10lb. The One Thousand Guineas and the Oaks are confined to fillies; in the others, which are open to both fillies and colts, the former are given an advantage of 3 lbs.

During the present century horse-racing has made much progress on the Continent, especially in France. The French Derby (Prix du Jockey Club) was established in 1836, the French Oaks (Prix de Diane) in 1843; but the great event of the

racine year in France is the Grand Prix de Paris (in June). The sport finds favour also in Germany and Austria, and is now gaining ground in Italy. Foreign horses, mostly of English parentage, have often been highly successful on the English turf; thus the French horse Gladiateur won the Two Thousand, Derby, and St. Leger in 1865, and the Derby has since fallen to the Hungarian Kisber in 1876, the French Rayon d'Or in 1879, and the American Iroquois in 1881.

Flat-racing in England is mainly under the direction of the Jockey Club, which is said to have been founded in 1750. Its rules were thoroughly revised in 1889. Besides the ordinary flat-racing there are steeplechasing (q.v.), hurdle-racing, and trotting (q.v.); the last is much in vogue in America. Betting (q.v.) is an invariable accompaniment of horse-racing in England.

Horse-radish (*Cochlearia Armoracia*), a perennial cruciferous plant native to eastern Europe, which has escaped from cultivation in England. It has a thick yellowish-white root with an acrid odour and pungent taste, for which the darker-coloured root of Aconite (q.v.) has been sometimes fatally mistaken. The horse-radish has large, oblong, serrate radical leaves, sometimes irregularly cut, and numerous small white flowers. The root, which is used as a condiment with roast beef and to a slight extent medicinally, owes its pungency to oil of mustard.

Horse-shoe, an iron rim of varying pattern used to protect the hoofs of horses. For a foot in good condition all that is needed is a plain shoe of about the same length and breadth throughout, well adapted to the shape of the foot. The "seated shoe," wider than the plain shoe, and therefore more serviceable in the case of horses with weak or flat soles, consists of a flat surface on which the crust rests and an inner portion sloping towards the sole. The shoes should be renewed after intervals of a month at longest. The removal of the old shoe requires great care. The subsequent paring should be confined to the rasping of the wall-surface on which the shoe has rested, the removal of the overgrown portions of the foot by means of the drawing-knife, and a final rasping round the lower edge of the crust after the shoe has been clinched. Except in the case of farm-horses employed on soft ground, the portion of the foot which has been exposed seldom needs cutting. The sole, frog, and bars should all be carefully preserved. As a general rule, five nails are sufficient, but when the horse has to draw heavy burdens seven or eight are necessary. To prevent tripping, the shoes for the fore-feet should be turned up a little at the toes. The hind-shoes are frequently turned down at the heels, and the inside heel is usually thickened.

Horsetails. [EQUISETUM.]

Horsley, SAMUEL (1733-1806), prelate and man of science, was born in London and educated at Westminster and Cambridge. He was elected a fellow of the Royal Society in 1767, and became one of the secretaries in 1773, but in 1784 he resigned

his membership owing to his opposition to Sir Joseph Banks (q.v.). He was for many years engaged in an acrimonious controversy with Priestley, occasioned by the latter's *History of the Corruptions of Christianity* (1782). He was raised to the see of St. David's in 1788, and became Bishop of Rochester in 1793 and of St. Asaph in 1802. Bishop Horsley published some scientific and other treatises, and edited the works of Newton (1785).

Horsok, a compound term applied collectively to the Hor-pa and Sok-pa, the two leading nations of the northern province of Katchi, Tibet, from the Karakorum to the Kuen-lun Mountains. The Hor, whose domain lies in the west, are of Tatar, the Sok of Mongolic, descent; but both are nomadic, roaming southwards into Bod-pa, that is, the settled Tibetan provinces. They are also for the most part Buddhists, and are bilingual, speaking both Tibetan and a common Mongolo-Tatar dialect. A few of the Hor-pa are Mohammedans.

Horticulture. This is now a branch of industry and recreation of great extent, variety, and importance, embracing as it does all that belongs to the garden, lawn, and orchard. Referring first of all to the out-door garden as the most important branch of horticulture, in this as in other countries with suitable climates, one cannot but be struck with the great increase within the last few years of the culture of hardy flowers in our gardens in the place of the tender "bedding" plants so much in vogue a few years ago. This "bedding out" craze had much to answer for in crippling a gardener's knowledge and effective use of the many fine hardy flowering plants which were so long neglected.

Bold masses of plants, especially of such things as tea-roses (which, by the way, are the most perpetual in flowering of all the roses), free-flowering and strong-growing types of carnations, pinks, pansies, especially of the kind called "tufted" lavender, the large-leaved saxifrages, spiræas, and other things too numerous to mention here, are most effective for spring and summer flowering. In autumn, too, the flower garden can now be well furnished with such fine plants as the perennial sunflowers (*Helianthus*), cone-flowers (*Rudbeckia*), chrysanthemums, hollyhocks, etc., and in the very late autumn the Michaelmas daisies (asters), planted in bold groups, are invaluable. Then, again, much better use is now made of the many fine flowering shrubs our gardens possess, by planting them in bold groups in well-prepared soil, and not frittering the effect away by dotting them here and there with no heed to the surroundings or locality. With regard to the all-important matter of outdoor, and indoor, vegetable and fruit culture, the increased attention paid to this matter in recent years by market-growers especially, is little short of marvellous—indeed, the amount of produce that a first-class market-gardener will get off a comparatively small area of ground by the aid of deep culture, liberal manuring, and keeping the land free of weeds is enormous both in bulk and quality. This latter matter of quality is often lost sight of by small growers and private gardeners, who market their produce, and hence, because they send

inferior stuff into the market, the returns are always unsatisfactory, and the business is carried on at a certain loss. Market-gardening can only pay when the output is first-rate in quality and very large in bulk. This applies equally to produce that is "forced" or raised with the aid of artificial protection and heat as to the outdoor crops. Fruit culture has also increased enormously of late years, and fruit-farms of large extent are being laid down yearly, and with every chance of success, especially where facilities exist for the immediate disposal and proper storage of fruit that will keep, like good late apples, of which we are never likely to get in this country an over-abundance. The chief thing in fruit-"farming" to note is to plant a good selection of sorts few in number, but good breadths of each one kind, selected according to its market value and suitability for the locality. Before embarking largely in this fruit industry, anyone should find out a good spot with a proper soil and favourable climate, and near to a railway or some other means of easy access to a market. Soft fruits such as strawberries, raspberries, etc.—can be very profitably used for jam. The drying of fruit, such as apples, etc., as practised in America, should also receive far more attention than has hitherto been the case from our fruit-growers. A remarkable increase has also taken place in recent years in the culture of grapes under glass by market-growers, and we now have vineries covering acres of ground, the output being enormous, and in some cases we should imagine that the prices obtained are far from remunerative. Tomatoes are also now produced in enormous quantities under glass, and, if of good quality, generally sell well. Peaches, if well managed under glass, no doubt still pay well. Pineapples are now no longer found remunerative, being replaced by the fine consignments to the markets of fruits from St. Michael's and other warmer climates where artificial heat is not required in the structures erected for their culture.

A great number of so-called new kinds of both vegetables and fruits have been added to our list of late years, and some of these are excellent; but it is best to proceed with caution in the selection of them, and when new kinds of fruit or vegetables are chosen it should only be those that are well suited to the locality in which they are to be grown. This matter of locality is a most important one, and because it is not heeded many failures result; a certain fruit or vegetable may do exceedingly well in one place on a certain soil, and entirely fail in another spot, however good the culture may be. Horticulture, to be successful, demands, above all things, a keen observation and great perseverance. Each apparently trifling operation connected therewith must be done promptly and thoroughly, and then profit and pleasure generally follow in due course. Not the least important factor in the greatly increased interest now apparent in matters connected with the garden is the fact of the existence of a well-organised horticultural press. Excellent and well-illustrated weekly and other journals filled with instructive matter are now within the reach of all, and this interchange of thoughts, opinions, and plans of

culture, etc., cannot fail to be of the greatest benefit to all attentive readers.

With regard to the humanising influence of horticulture on men and women, it would be difficult to over-estimate its far-reaching power and value. Trees, shrubs, and flowers are now gathered from every clime, and each one adds an attractive feature to the garden in its allotted spot. The care and industry requisite to obtain the best results from tending our favourite plants and flowers is of the highest value, and very many of our busiest workers in commerce, etc., find a change of occupation and a form of recreation thereby in the garden that nothing else can bring, and this very change of work quickens observation and thought, and thus we are all better enabled to do satisfactory work in life. A love of horticulture is undoubtedly a blessing to all who have a garden, however small.

Hosea, one of the twelve minor prophets. His book tells us that he was the son of one Beêri, a citizen of the kingdom of Judah, and that he prophesied in and after the reign of Jeroboam II., during the latter part of the 8th century B.C. His marriage to Gomer-bath-Diblaim, whom he divorced on account of her infidelity but afterwards received back, is symbolical of the rebellion and idolatry of Israel and the ultimate pardon of Jehovah. Of the fourteen chapters, eleven consist of denunciatory prophecies of a somewhat vague character, in which the social state of the kingdom is represented as extremely corrupt.

Hosier, SIR FRANCIS, naval officer, born about 1670, became a captain in 1696, and as such performed much assiduous and useful service, chiefly in cruisers. He was made a rear-admiral in 1719, and a vice-admiral in 1723, and in 1726 was sent as commander-in-chief to the West Indies, where the misfortunes of his fleet were unexampled. Hosier died of grief and disgust in August, 1727. His merit and misfortunes suggested to Richard Glover the subject of the well-known ballad *Admiral Hosier's Ghost*.

Hosiery, stockings and other textile fabrics made by knitting. Hand-knitting is said to have originated in Scotland in the 15th century. Machine-knitting dates from 1589, when the knitting-frame or stocking-frame was invented by the Rev. William Lee, a Cambridge graduate, born at Woodborough in Nottinghamshire. This machine consists of a number of hooked needles which are fixed in line and act together, yet in such a way that each controls the working of a single loop. Between each needle and that next it there is placed a thin plate of metal called a "sinker," which moves backwards and forwards, so as to force the thread of yarn—which is laid over the stems of the needles inside the hooks—into a series of loops. The needle then descends, and as it does so the hook comes into contact with a "presser bar," which forces the point of the barb into a groove in the stem of the needle, thus forming a closed eye, within which the loop is caught. As the needle descends farther, this loop is pulled through that which was last formed. The needle then ascends again and the operation is repeated, resulting in the addition of

another loop to the knitted fabric. All subsequent inventions in the hosiery manufacture have started from the principle of Lee's machine. The most important improvements were those of Jedediah Strutt (1758), who introduced a series of ribbing-needles, at right angles to the plain needles; of Sir Marc I. Brunel (1816), who invented the *tricoteur*, or circular stocking frame, for producing a tubular web, a machine which only became known in the improved form due to Peter Claussen (1845); and finally the tumbler needle of M. Townsend (1858). Since that date alterations for the better in the arrangement and construction of the knitting-frame have been made by William Cotton of Loughborough, and the Americans, W. C. Gist (1858) and Almet Reid (1877).

The chief centre of the hosiery trade in Great Britain is the town and county of Nottingham; it also extends to Leicestershire, Derbyshire, and other neighbouring counties. On the Continent Saxony takes the lead in this branch of industry. Machine-knitting is carried on very extensively in New York State and the New England states of North America. Cotton, wool, and silk are all employed in the hosiery manufacture. The articles produced comprise stockings, hats and bonnets, gloves, shawls, and every variety of underclothing. [The standard work on the knitting-frame is Felkin's *Machine-wrought Hosiery and Lace* (1867).]

Hospitallers. The Knights Hospitallers, or Knights of the Order of St. John of Jerusalem, afterwards known also as the Knights of Rhodes or of Malta, was one of the military orders which grew up in connection with the Crusades. Between 1023 and 1099 two hospitals were founded at Jerusalem by certain merchants of Amalfi, one for male, the other for female pilgrims. The church attached to the former was originally dedicated to St. John the Almoner, afterwards to St. John the Baptist. The germ of the order is to be found in an association of pilgrims who after their own recovery resolved to devote their lives to the service of the hospital. After the expulsion of the Turks from Jerusalem (1099), many Crusaders joined the body, and at the suggestion of their rector, Peter Gerard, they formed themselves into a religious order, which in 1113 received the sanction of Pope Pascal II. Under Gerard's successor, Raymond du Puy, the order was reorganised on a military basis. It was removed to Margat in Phœnicia in 1187, to Acre in 1287, and to Cyprus in 1291. In 1310 the knights captured the island of Rhodes, whence they were expelled by the Sultan Solymán in 1522. In 1530 Charles V. granted them the islands of Malta and Gozo with the city of Tripoli. The famous siege of Malta, in which the Turks were finally repelled mainly through the gallantry and determination of the Grand Master La Valette, took place in 1565. In 1798 the island was seized by the French. Since that time the order has almost ceased to exist; the office of Grand Master has been vacant since 1801, but a Deputy Grand Master is still appointed. The order originally comprised three classes—Knights, Chaplains, and Serving Brothers. The knights were divided into eight

"languages," those of Provence, Auvergne, France, Italy, Aragon, Germany, Castile, and England. Each language had several Grand Priorities, to which were attached Commanderies or resting-places for pilgrims on the sea-coast.

Hospitals, charitable institutions for the relief or support of persons unable to satisfy their own wants. The term is now usually applied to medical hospitals or infirmaries whether general or special. The two oldest general hospitals in London—St. Bartholomew's (1547) and St. Thomas's (1553)—were originally religious foundations. Five more were added during the earlier half of the 18th century, which was a period of great activity in hospital-building—viz. the Westminster (1719), Guy's (1723), St. George's (1733), the London (1740), and the Middlesex (1745). One of the oldest of the special hospitals is Queen Charlotte's Lying-in Hospital (1752). Hospitals for consumption, ophthalmia, cancer, hip disease, and other specific diseases are now numerous in large towns in this country and on the Continent. Many of these complaints are excluded from the general hospitals. This is almost always the case with smallpox, scarlet-fever, and other contagious diseases, for which isolation hospitals are now provided under the control of the Metropolitan Asylums Board. With the exception of the last-mentioned class, which are supported out of the rates, and the naval and military hospitals, almost all hospitals are dependent on voluntary contributions. The chief hospitals in London and several other large towns serve a two-fold purpose; besides affording medical and surgical aid to the poor, and in cases of emergency to more opulent patients also, they furnish the best education in medicine and surgery by means of practical demonstration. In this manner the members of the medical profession in England receive an invaluable training in the great general hospitals. Up to a recent date very little regard was paid by the administrators of hospitals to the proper treatment of the inmates. The unsanitary condition of hospitals in former times, which is proved by the abnormally high death-rate, especially in lying-in hospitals, was due mainly to overcrowding, insufficient ventilation, a disregard of cleanliness in details, unsuitable diet, and, to a certain extent, the mixture of cases of different kinds. A great improvement has taken place in these respects owing to the greater attention now paid to construction, administration, and nursing. As regards construction, the first point to be considered is the selection of the most suitable site which is accessible to the persons for whom the hospital is intended. A dry soil should be chosen, and a free space should be left between the hospital and the neighbouring buildings. The number of patients placed in a single block should never exceed one hundred. This is now secured by adopting the pavilion form of building, in which a number of pavilions are connected by covered ways. The patients' wards should not occupy more than two storeys; if possible there should be one storey only in each pavilion. The wards should be completely separated

from the kitchen and other offices, excepting the lavatories, etc., intended for the use of the patient, and these should have a separate system of warming and ventilation. To ensure proper ventilation, the wards should be rectangular in form, with windows in each of the opposite walls. The breadth should be 25 or 26 feet, with a row of beds along each wall. The importance now attached to efficient nursing must be in great measure ascribed to the efforts of Miss Florence Nightingale. The nurses act under the direction of the medical staff, yet their position is one which requires a considerable amount of judgment, gentleness, and tact. It is only within recent years that "cottage hospitals" have been erected for the rural population; previously they were obliged to have recourse to those in the larger towns. They are built on the pavilion system, a cottage hospital resembling a detached portion of a larger one. Separate hospitals are now provided for children and convalescents, since in both cases the treatment required is of a special kind. In all civilised countries there are hospitals for soldiers and sailors supported by the State. The most important naval hospitals in England are those of Haslar, Plymouth, and Chatham. The chief military hospitals are situated at Netley, Woolwich, and Aldershot; in addition to these the principal stations have hospitals of their own.

A few words must be said about non-medical hospitals, *i.e.* those which afford a refuge to persons who are prevented by physical or mental incapacity from taking care of themselves. The alarming increase of poverty in the 16th century led many charitable persons to erect and endow buildings for the support of the aged poor. The number of such *almshouses* dating back to the 16th and 17th centuries is very large. From the reign of George II. onwards it was sought to secure the same end by means of *workhouses*, supported out of the rates and administered in connection with the poor laws (q.v.). Most institutions belonging to this class are now known by some other name, but there are instances to the contrary—*e.g.* *Foundling Hospitals* (q.v.), and *Hospitals for Incurable Diseases*, such as chronic rheumatism, paralysis, and gout. To the latter group virtually belong the *Poor-law* or *Parish Infirmaries*, which, since 1870, have taken the place of workhouses as a refuge for destitute persons suffering from chronic or incurable complaints.

Host (Lat. *hostia*, a victim), the consecrated bread used in the Roman Catholic Church in the celebration of the Eucharist, so called because in the doctrine of that church this sacrament repeats the *sacrifice* of the crucifixion. It consists of a thin wafer of unleavened bread, on which is imprinted a lamb or some other emblem. According to the judgment given in the *Purchas* case (1871) the use of the wafer is prohibited in the Church of England. The elevation of the Host takes place when the priest, after consecrating the bread, raises it above his head with both hands, that the body of Christ may be seen and worshipped by the whole congregation.

Hoste, SIR WILLIAM, BART., British naval commander, who was born about 1780, served with Nelson at Teneriffe in 1797, and was made a post-captain in 1802. In 1811 he gained a remarkable victory over a Franco-Venetian squadron of largely superior force. In 1813, in the *Bacchante*, he commanded the squadron which reduced Ragusa and Cattaro. For these services he was made a baronet in 1814, and in 1815 was given a K.C.B. He died in 1828, being still a post-captain.

Hostilius, TULLUS, the 3rd mythical King of Rome, succeeded Numa Pompilius in 670 B.C. He arranged the combat between the Horatii (q.v.) and Curiatii, and afterwards destroyed Alba, the inhabitants of which were transferred to Rome and placed on the Mons Cælius. He also subdued Fidenæ and Veii. He perished through the jealousy of the gods, who consumed his house with fire.

Hotham, the surname of a distinguished English naval family, of which WILLIAM, first Lord Hotham, born about 1732, in 1759 gained great credit for his share in the capture of the *Danae*. In 1776, as commodore, he convoyed to America a fleet of transports laden with troops, and took part in the expedition against Rhode Island, and, in 1777, in that against Albany. In 1780, again as commodore, he shared in the relief of Gibraltar, and in 1787 was promoted to flag-rank. Appointed vice-admiral in 1793, he was immediately given the second command in the Mediterranean, and in 1794 succeeded Lord Hood as commander-in-chief. In the following year he defeated the French rear-admiral, Martin, and took from him two ships of the line. At the end of the year he resigned his command, and in 1797 was raised to the Irish peerage. He had been made a full admiral in 1795, and he died in 1813.

Hotspur. [PERCY.]

Hottentots, a South African people whose original home was the whole of the Continent south of the Zambesi, but who are now mainly confined to the south-west corner from about the parallel of Walvisch Bay southwards to the neighbourhood of Cape Town. Hottentot is merely a term of contempt imposed on them by the early Dutch settlers, apparently in the sense of "stutterers," "jabberers," in reference to the harsh, inarticulate sounds of their language. The most general national name is *Khoi-Khoi*, "Men of Men," or *Hou-Khoi*, "True Men," *i.e.* men in a preeminent sense, and these expressions are current amongst all three branches:—The *Namas* (Nama-qua) who give their name to Great and Little Namaqualand, and who are the present representatives of the race; the *Koranas* (Kora-qua) of the Middle Orange and Vaal rivers, and the half-caste *Grigwa* of West and East Griqualands. Their origin and relations to the surrounding Bushmen and Bantu (Negroid) populations are questions still much discussed by ethnologists; but the most generally received opinion now is that they are a cross between these elements, speaking a language fundamentally the same as that of the Bushmen, and in their physical appearance holding a position

somewhat intermediate between the two. They are generally somewhat below the middle size, with disproportionately small hands and feet, feeble muscular development, broad flat nose, slightly oblique and deep-sunk eyes set wide apart, abnormally prominent cheek bones, which with the pointed chin give the face a decidedly triangular form. Other marked peculiarities are the large lobeless ears, large mouth with thick, pouting lips, yellowish brown skin like that of a European suffering from jaundice, short woolly black hair growing in tufts, highly dolichocephalic head with cranial capacity far below that of the negro, pronounced prognathism, and in the women the distinctively racial developments known as the *tablier* and *steatopygia*, which they have in common with the Bushman women. The Hottentot language, spoken with little variety by all the branches, shows little affinity with any other African tongue, except the Bushman, with which it agrees in general structure, vocabulary and the peculiar sounds known as clicks, which are unpronounceable by Europeans, and of which Bushman has six and Hottentot four (palatal, cerebral, dental, and lateral), occurring only before initial vowels and gutturals. Even more remarkable is the elaborate system of nominal and verbal inflections, and especially the three grammatical genders, which Hottentot has in common with Aryan; but all of which are found in no other linguistic family. The roots are monosyllabic, either concrete or formative, and these are joined together directly, not, as in Aryan, to the stem, that is, to a root modified for the purpose of receiving the inflections. Thus both in physique and speech the Hottentot-Bushman group stands quite apart from all other divisions of mankind. The Namas still preserve the tribal organisation and the nomad pastoral habits of the race. But in the Cape the tribes have been broken up and the chiefs replaced by magistrates since the beginning of the present century. Here also many speak Dutch or English exclusively, and all have been evangelised mostly by Protestant missionaries. Very few full-blood Hottentots are now found outside Namaqualand, and the so-called Gonaqua, or "Borderers," are a mongrel race of Hottentots, Kafirs, and "Mozambiques" (negroes from the east coast), thinly scattered over the eastern provinces of Cape Colony proper. Another degraded group are the "Hill Damaras" of Damaraland, for which see HERERO. At present the whole race scarcely numbers more than 200,000 altogether, of whom 20,000 Namas of pure descent, the rest Koranas, Griquas, Gonaquas, and others, mainly half-breeds. (N. H. J. Bleek. *A Comparative Grammar of South African Languages*, 1862, and numerous other writings; H. Hahn. *Die Sprache der Nama*, etc., 1870; G. Fritsch. *Die Eingeborenen Süd. Afrika's*, etc., 1872; Lady Barker, *Letters from South Africa*, 1877.)

Hotti, a powerful Albanian tribe on the Montenegro frontier. They take their name from the village of Hot, which has always been their chief stronghold. They hold the first rank amongst the

semi-independent tribes of North Albania, though less numerous than some of their neighbours; population 6,000 to 7,000.

Houdon, JEAN ANTOINE (1741-1828), a celebrated French sculptor, was born at Versailles. After ten years' residence in Rome, where he produced his colossal statue of St. Bruno, he returned to France, and in 1777 was elected a member of the Academy. In 1805 he became professor in the Ecole des Beaux-Arts. Houdon excelled in portraiture, and his works include likenesses of Rousseau, Voltaire, Diderot, Washington, Napoleon, and many other celebrities.

Houghton, RICHARD MONCKTON MILNES, 1st BARON (1809-85), was born at Fryston Hall, Yorkshire, and educated at Trinity College, Cambridge, where he was the friend of Tennyson and Arthur Hallam. After leaving Cambridge, he travelled much abroad, recording his impressions in several volumes of verse, of which *Palm Leaves* (1844), dealing with Eastern life and thought, is the best known. But Lord Houghton's position in literary history is due rather to the keen interest he took in contemporary poetry and the advice and encouragement he held out to struggling young authors than to any writings of his own. Perhaps his best-known work is his *Life and Letters of John Keats* (1848). During his career in the House of Commons (1837-63) he was successively the follower of Peel, Lord John Russell, and Palmerston. He was ever on the side of liberty abroad and social progress at home; he supported the Italians and the Poles in their struggles for independence, and the First Juvenile Reformatory Bill was due to his efforts. His son (b. 1858), who is known as a writer of graceful verse, was appointed Lord-Lieutenant of Ireland in 1892.

Hound, an inclusive term for dogs that hunt by scent, not by sight. [BEAGLE, BLOODHOUND, FOXHOUND, HARRIER, STAGHOUND.]

Hounslow, a town of Middlesex 10 miles west of London. It was once an important posting station, but its fame is mainly derived from the Heath which skirts the road for a distance of 5 miles and in old days was infested by highwaymen. The greater part of it is now enclosed.

Hour is a useful measure of time. It is the twenty-fourth part of the sidereal, solar, or mean-solar day, each of these giving a different value to the corresponding hour. The hour most familiar is that based on mean-solar time. In astronomical observations sidereal time is taken. [DAY.]

Housebreaking is the offence of breaking and entering a dwelling-house or building occupied therewith, or a school-house, shop, warehouse, or counting-house to commit any felony therein, or where a person commits a felony in any such building and then breaks out of it. The maximum punishment is 14 years' penal servitude. [BURGLARY.]

House-leek (*Sempervivum tectorum*), a plant belonging to the Crassulaceæ, native to the Alps, but commonly seen on the roofs of out-houses in

England and elsewhere, being supposed to be a protection against lightning, whence its German name "Donnerkraut." It has a rosette of fleshy spinously-pointed radical leaves, and multiplies itself by closely-grouped offsets. Its flower-stalk is pink and fleshy, and bears a flat reflexed cyme of pink flowers, each with about a dozen petals. The leaves contain malic acid, and are a popular remedy for bruises, swellings, stings, burns, corns, freckles, etc.

Housemaid's Knee. The bursa interposed between the patella or knee-cap and the skin is often affected by inflammation and chronic enlargement, particularly in those whose occupation compels them to frequently adopt the kneeling posture. Hence the term housemaid's knee is commonly applied to the condition of enlargement of this bursa, just as similar enlargement of the bursa over the elbow is known as miner's elbow. The treatment of housemaid's knee consists in the application of counter-irritants, such as iodine, with accompanying pressure; in some instances it may be necessary to puncture the swelling or even to dissect out the thickened wall of the bursa.

House of Commons, CLERK OF, an officer appointed by the Crown, whose duty it is to record the proceedings of the House, which are entered by himself or his deputies upon its journals. He also receives and takes charge of the petitions presented to the House, and generally assists the Speaker in the details of his onerous duties. He is usually a barrister-at-law. Similar officers are employed in the House of Lords. By a statute passed in the 33rd year of the reign of George III. the Clerk of Parliament is directed to indorse on every Act, immediately after the title thereof, the day, month, and year when the same shall have passed, and shall have received the Royal assent, and such indorsement shall be taken as part of the Act, and shall be the date of its commencement where no other is provided by the Act.

Houston, a town of Texas State, United States, on the Buffalo Bayou, 49 miles N.W. of Galveston. It is an important railway centre and river port, shipping cattle, grain, and other commodities in large quantities.

Houston, SAMUEL (1793-1863), an American soldier and politician, was born in Virginia, but removed to Tennessee at an early age, and was on familiar terms with the Cherokee Indians, among whom he lived for three years. From 1813-15 he served in the United States army, rising to the rank of lieutenant. He then studied law, and in 1823 represented Tennessee in Congress, and became governor of the State in 1827. In 1830 he joined the Cherokee Indians, and took their part at Washington against the agents who cheated them. In 1832 he went to Texas, and during the war of independence he was commander of the Texas forces, and defeated Santa Anna's army. He was the first president of the new Texan republic, and when it became a state in 1845 he represented it in the Senate. He was made governor of Texas in 1859, but retired in 1861 upon the question of secession.

Houtman, CORNELIUS VAN, Dutch seaman, was commander, in 1594, of the first Dutch expedition to the East Indies; but on a subsequent voyage, on which he was accompanied by John Davis, the English navigator, he was murdered by the natives of Acheen. His brother FREDERICK, who also accompanied him, was at the same time taken prisoner, and during a two years' captivity compiled the first Malay dictionary, and made many valuable observations of stars in the southern hemisphere.

Hova (pronounced *Hura*), the ruling nation of Madagascar, who are chiefly confined to the province of Imerina, in the central part of the inland plateau. Of all the Malagasy peoples the Hovas have best preserved the original Malay type, though a distinct strain of Negro blood is betrayed in their frizzly hair and tumid lips. *Hova*, a term of doubtful origin, is properly the name of the middle classes, the nobles calling themselves *Andriana*, while the slaves are collectively known as *Mainti* or *Andero*. The Hova peasantry are industrious tillers of the land, courteous and hospitable, while those of the capital and other large towns have the reputation of being "past-masters in the arts of deceit and cajolery." They are, however, remarkably intelligent, mostly Protestants, well-educated and skilful craftsmen. Through the Hovas western culture is gradually spreading over the whole island, though its progress has been somewhat checked by the recent meddlesome interference of the French in the internal affairs of the kingdom. (*The Antananarivo Annual, etc.*, 1875-92; J. Sibree, *Madagascar and its People*, 1870; H. W. Little, *Madagascar: its History and People*, 1884.)

Hoveden, ROGER OF, an English chronicler of the 12th century who is thought to have been born at Howden in Yorkshire. He appears to have studied law, and to have become a member of the court of Henry II., whom he accompanied to France. The king sent him on a diplomatic mission to Scotland, and also employed him to negotiate with the abbey at Reading with regard to filling vacant abbacies. In 1189 Roger was Justice Itinerant in the northern counties, and is thought to have retired into private life at the king's death, and to have written his history at this period, and possibly at Howden. He divides his work into two parts, the first dealing with events prior to Henry II.'s accession, and the second carrying the history down to the year 1201. Much of his work is an adaptation from earlier chronicles, but the record of the last ten years in his history is entirely original.

Howard, CATHERINE (*circa* 1520-1542), was the granddaughter of the second Duke of Norfolk and wife of Henry VIII., who married her after his divorce from Anne of Cleves in 1540. In 1542 Queen Catherine was arraigned, condemned, and beheaded, on a charge of immoral conduct before her marriage with the king.

Howard, CHARLES, LORD HOWARD OF EFFINGHAM, and, later, EARL OF NOTTINGHAM, seaman and statesman, was son of William, first Lord Howard of Effingham, and grandson of the second Duke of Norfolk, and was born in 1536. In 1569 he

held a military command during the Northern Rebellion. In the following year, however, he was made an admiral, and, though a Roman Catholic, was created a K.G. and Lord Chamberlain in 1574, and Lord High Admiral of England in 1585. In the following year he was one of the commissioners for the trial of Mary Queen of Scots, whose execution he strongly advocated. In 1588 he commanded in chief, with conspicuous ability and success, against the Spanish Armada, with his flag in the *Ark Royal*; and in 1596 he led the naval attack upon Cadiz, and for his services was in 1597 created Earl of Nottingham. In 1599, as an additional reward, he was made Lord-Lieutenant-General of All England. In 1601 he helped to suppress Essex's rebellion, and in 1605 he went as ambassador-extraordinary to Spain. These were his last services of importance. He died in 1624.

Howard, SIR EDWARD, son of Thomas Howard, Earl of Surrey and second Duke of Norfolk, was born about 1470, and, having been created Lord Admiral of England, distinguished himself in 1510 by defeating and killing the celebrated Scottish privateer, Andrew Barton. In 1512 he fought an indecisive action with the French off Brest, and in the following year, in a second action in the same neighbourhood, he was killed. As Lord Admiral, his brother SIR THOMAS, who in 1524 succeeded to the dukedom of Norfolk, followed him.

Howard, JOHN (1726-90), an English philanthropist, was born at Enfield, and apprenticed while young to a firm of grocers in the City of London. His father's death in 1742 enabled him to abandon this line of life and to spend a year in foreign travel. On his return to England he settled at Stoke Newington, and in 1752 he married. His wife's death in 1755 unsettled him, and he started for Portugal, but was captured by a French privateer and was for some time a prisoner of war. After his exchange he again settled down in England, and married a second wife, who died in 1765. He then went abroad to France, Switzerland, Italy, and Germany; and on his return to England he again settled down on his estate, and in 1773 became High Sheriff of Bedfordshire, an appointment which turned his attention to prison reform. His first efforts were directed against the practice of paying gaolers by fees, and investigations on this point led him to attack other abuses and shortcomings. His evidence before a Parliamentary Commission in 1774 resulted in the passing of two bills abolishing gaolers' fees and providing for a better sanitary condition in prisons. Howard then carried on his prison investigations in Scotland, Ireland, France, Flanders, Holland, and Germany, and in 1777 published the result of his labours in a book—*State of the Prisons in England and Wales, with Preliminary Observation, and an Account of some Foreign Prisons*. The rest of his life was spent in further inspection of prisons at home and abroad. He underwent in some places much difficulty and danger in carrying out his objects, and embodied from time to time the additional facts that came to his knowledge in new editions of his former work. His last journey abroad began in 1789, and early in

the next year he died of camp-fever in Kherson. His statue was erected in St. Paul's Cathedral, and was paid for by public subscription, and was, moreover, the first statue set up in the cathedral. There is a portrait of him in the National Portrait Gallery. His researches were carried out at his own expense, and were the undoubted cause of the many reforms in the treatment of prisoners that have been introduced in the present century.

Howard, OLIVER, an American general, was born in 1830, and received his military training at West Point. In 1861 he commanded a volunteer regiment in the Civil War, and was made brigadier-general after the battle of Bull Run. He took part in many later actions, and commanded the right wing of General Sherman's army. In 1877 and 1878 he commanded in two Indian campaigns, publishing an account of one of them in 1881. In 1884 he was enrolled in the Legion of Honour.

Howe, JOHN (1630-1706), a Puritan divine, was born at Loughborough, in Leicestershire, in which parish his father was curate for some years till his suspension for alleged irregularity by the Court of High Commission in 1634. The son was a graduate of both Cambridge and Oxford, and was elected fellow of Magdalen College in the latter university, and, having taken orders, he was appointed perpetual curate first of Great Torrington and then of St. Saviour's, Dartmouth. Having pleased Cromwell by his preaching at Whitehall, he was appointed chaplain to the Protector, a post in which he won the respect of all. Upon the deposition of Richard Cromwell (1659), Howe, who had a high opinion of the unappreciated Protector, returned to Torrington, where he officiated, but not without persecution, till 1662, when he was ejected in accordance with the terms of the Uniformity Act. In 1670 he went to Ireland as domestic chaplain to Viscount Massereene, and five years later he became pastor of a Presbyterian congregation in London. In 1685 he went abroad and settled at Utrecht, but returned in 1687, and after the accession of William III. was a great advocate of mutual toleration and forbearance, and also of a union between Presbyterians and Congregationalists. His later years were quiet and uneventful. *The Living Temple* and his many other works were published in eight volumes in 1822, and there are memoirs of his life.

Howe, RICHARD HOWE, first Earl, was second son of Scrope, second Viscount Howe, and was born in 1726. At the age of fourteen he left Eton to accompany Commodore Anson to the South Seas, but participated only in the first half of that celebrated voyage. In 1743 he shared in the attack on La Gnaira, and in 1745 was made commander and in 1746 captain. He took part in the expedition to Basque Roads in 1757, was commodore on the coast of Brittany in 1758, and fought at the battle of Quiberon Bay in 1759. From 1765 he was Treasurer of the Navy, and in 1770 reached flag-rank, and was made commander-in-chief in the Mediterranean. Promotion to vice-admiral followed in 1775, and in the following year Howe went as

commander-in-chief to the North American station, where he remained for two years. As admiral and commander-in-chief in the Channel in 1785, he relieved Gibraltar, and in 1783 became First Lord of the Admiralty. At the expiration of his term in that capacity, having previously succeeded to the family title, he was created Earl Howe. In 1792 he was made vice-admiral of England, and, upon the outbreak of war in 1793, returned to the Channel, flying the Union at the main by special order. After some preliminary skirmishing in 1794, he brought to action the French fleet off Ushant, and on "the Glorious First of June" defeated it. King George visited the Earl upon his arrival at Spithead, and presented the victor with a sword worth £3,150, a gold chain and a medal. Other honours were showered upon Howe, who, however, owing to growing ill-health, had to resign his command in the Channel in 1795 and that of the Western Squadron in 1797. In 1796 he was made Admiral of the Fleet and General of Marines, and in 1797 he received the Garter. He died in 1799.

Howell, JAMES (1594-1666), an English author, was the first to write an English handbook of foreign travel. He was the son of a Welsh minister in Carmarthenshire, and graduated at Jesus College, Oxford. Being sent abroad to find foreign workmen for some glassworks of which he was steward, he visited France, Spain, Italy, and Holland. Soon after he was sent with Lord Digby's embassy to Spain, and in 1632 he accompanied the Earl of Leicester's embassy to Denmark. In 1626 he had been appointed secretary to Lord Scrope, Lord President in the North, and in 1627 he sat in Parliament for Richmond, and in 1642 was made clerk of the Privy Council. From 1643-48 he was imprisoned for his royalist views. In 1660 he was appointed historiographer to the king. Besides his book on foreign travel his best-known works are a collection of *Letters (Epistolæ Ho-Eliaŋæ)*, an *English, French, Italian, and Spanish Dictionary*, allegorical *Discourses of Trees*, a *Spanish English Grammar*, several Italian and Spanish translations, and a *Life of Louis XIII.*

Howells, WILLIAM DEAN, an American novelist, was born at Martin's Ferry, Ohio, in 1837. He began his literary career as a journalist. He wrote a life of Lincoln in 1860, and from 1861-65 he was consul at Venice, his *Venetian Life* being the result of his residence there. Having done much work as a journalist and critic, he became in 1872 editor of the *Atlantic Monthly*, a post which he held for some years. He likewise contributed to the *Century*, and to *Harper's Magazine*. His first novel, *Their Wedding Journey*, was published in 1871, and has been followed by a regular succession of others as to whose merits opinions are much divided. Among these may be mentioned *The Lady of the Aroostook*, *The Rise of Silas Lap- ham*, and *An Indian Summer*.

Howitt, WILLIAM (1795-1879), English poet and author, was born at Heanor, in Derbyshire. His first published work, a poem, appeared in 1814. In 1823 he married a lady, who was, like himself, a

member of the Society of Friends, and who also wrote much, sometimes in conjunction with her husband, and sometimes independently. A collection of joint poems was issued in 1827, and from that time a constant stream of works issued from their prolific pens. To cite a few, we have *Rural Life of England*, *Visits to Remarkable Places*, *Rural and Domestic Life of Germany*, *Literature and Romance of Northern Europe*, *The Illustrated History of England* (for Messrs. Cassell), and *A Boy's Adventures in Australia*, this last work with some others of a similar nature being the fruit of a two years' visit to that continent. The pair published many works on local antiquities, and William Howitt translated from German and Swedish.

Howitzer, a short gun for shells. It is longer than a mortar. It was at one period displaced in the sea-service by the carronade, but has recently been reintroduced as a short, heavy breechloader.

Howker, vulgarly HOOKER, a small Dutch vessel of not more than 200 tons with main and mizen masts. Also a one-masted fishing-boat used on the south coast of Ireland. The name is, in addition, applied loosely and familiarly to any vessel.

Howler, HOWLING MONKEY, any monkey of the genus *Myctes* with several species from Central and South America. They are large, powerful monkeys, with prehensile tails. The loud rolling noise whence they derive their name is produced by the enlargement of the hyoid bone and a strong muscular apparatus in the throat.

Howrah, a town on the right bank of the Hooghly, Lower Provinces of India, and opposite to Calcutta, of which it forms a suburb, communication between the two being carried on by means of ferry steamers and a pontoon bridge. The East Indian Railway has a terminus here, and there are important dockyards. In the neighbourhood are botanical gardens, and the Bishop's College.

Hoy, a small vessel usually rigged as a sloop, and used for the transport of passengers or goods from place to place, or from shore to ship: especially a vessel used for transport of powder, shell, etc., to men-of-war. The Dutch hoy has two masts.

Hoyle, EDMOND (1672-1769), the first of the series of writers upon whist, and other games. He is said to have been a barrister, and to have given lessons in whist. His *Short Treatise* was printed in 1742, and was followed by handbooks on backgammon, picquet, quadrille, and brag. Many editions of the *Short Treatise* have been issued, and it has been translated into French, German, and Italian. He also wrote upon the doctrine of Chances.

Huanaca. [GUANACA.]

Huastecs, an historical people of Mexico, who occupy the northern parts of the province of Vera Cruz between the sea and the Sierra Madre. The Huastecs are the northernmost branch of the Maya family, separated by numerous intervening

nations from the kindred peoples of Yucatan. At the time of the Spanish conquest (1520) they had already been settled from time immemorial in their present domain, which, according to some authorities, is the cradle of the Maya race. Their language is still spoken in Vera Cruz and San Luis Potosi, while the Totonac, another member of the same Maya family, is current in Puebla and in the southern districts of Vera Cruz. A Mexican writer describes the Huastecs as a powerful and wealthy people, who wore gold ornaments in their ears and lips, inserted sharp chips of white stone in the nostrils, and carried little round mirrors at their girdles.

Huber, FRANÇOIS (1750–1831), a Swiss naturalist, whose special subject was the honey-bee, was born at Geneva. Early study led to disease of the eyes which resulted in blindness, and his minute observations upon the habits and history of bees were carried on through the devoted and systematic labours of his wife and a servant. His *Nouvelles Observations sur les Abeilles* has been translated into English. He also wrote other papers on kindred subjects, and his taste for natural history was handed on to his son.

Hubert, ST., Bishop of Liège and patron of sportsmen, was the son of Bertrand, Duke of Guienne, and a courtier of Theodoric and Pepin of Heristal. Tradition relates that he was, when a layman, passionately fond of the chase, and that the appearance of a stag with a crucifix between his horns converted him as he was hunting on one Good Friday. He entered a monastery, and afterwards, when bishop, built a cathedral at Liège. One hundred years after his death, in 727, his body was translated to an abbey in the Ardennes, around which a town sprang up, owing to the resort thither of innumerable pilgrims. There is still a considerable traffic in medals, which are considered to be of efficacy as a preservative from hydrophobia. A picture in the abbey-church at St. Hubert illustrates the stag episode.

Hubli, an Indian town, in the Dharwar district of Bombay, 13 miles S.E. of Dharwar, and 230 miles S.E. of Poona. It is the centre of a considerable cotton trade, and its position on the main road to Poona gives it a vigorous general trade.

Huc, EVERISTE (1813–1860), a noted French missionary, was born at Toulouse. In 1839, being then a priest, he started on missionary work in China, where he learnt the language, and adopted the dress and, as far as possible, the habits of the country. For some time he presided over a mission centre in Mongolia, and studied the dialects and customs of the Tartars, and translated religious works for their benefit. In 1844 he set out with another priest, named Gabet, and a native Christian, upon the journey of exploration in Thibet which made their names famous, and which ended in their being sent back to Canton at the request of the Chinese ambassador. The *Souvenirs of Travels in Tartary, Thibet, and China* were translated into English by W. Hazlitt in 1851. *L'Empire Chinois* and *Le Christianisme en*

Chine have also been translated into English. Huc spent his latter days in ill-health at Paris.

Huddersfield, municipal and parliamentary borough (1 member) and market-town of the West Riding of Yorkshire, is on sloping ground near the Colne. The buildings are mostly of stone, and the town has been greatly improved and extended since its rise in manufacturing importance and its becoming the chief home of the fancy woollen trade. Among the public buildings are several churches and other places of worship, the cloth hall, the Armoury lecture halls, baths, Huddersfield college, chamber of commerce, and Gothic market-hall. There is a public park of 21 acres, given to the town by Mr. H. F. Beaumont, and bearing his name. Besides the manufacture of nearly every species of fancy woollen goods, the chief industries are silk and cotton mills, foundries, engineering and machinery works, organ factories, chemical and dye works. In the neighbourhood of Huddersfield was the Roman station of Cambodunum, and the place itself is mentioned in Domesday. Coal is found in the neighbourhood, and there is a sulphurous spring. Robin Hood is said to have been buried near Huddersfield.

Hudson, GEOFFERY (1619–1682), a celebrated English dwarf, born at Oakham in Rutlandshire. The story goes that he was brought to table before Charles I. and his Queen Henrietta, enclosed in a pie, and that he was then attached to the queen's suite. In 1630 he was sent on a mission abroad, and was captured by Flemish pirates. After his return from captivity he was made captain of horse. He was so unfortunate as to be again captured by pirates, and during this imprisonment he grew considerably. After the Restoration he was pensioned, but being accused of participation in the Popish plot, was imprisoned, and is said to have finished his life in prison. Scott introduces him with effect in the *The Fortunes of Nigel*.

Hudson, HENRY, English navigator, born about 1550, made four arctic voyages between 1607 and 1610, and on the last discovered what after him have been called Hudson Strait and Hudson Bay (q.v.). While returning at the close of the third of these voyages, he was cast adrift in an open boat by his mutinous crew, and was never again heard of. While in the service of the Dutch East India Company he had explored the coast of North America and the river which bears his name (1609).

Hudson Bay is an inland sea of British America, north-west of Canada, but included in the Dominion, between lat. 51° and 64° N., and long. 77° and 95° W., about 1,000 miles from north to south, with a greatest breadth of 600 miles, and containing, with its gulfs and inlets, 500,000 square miles. It is connected with the Atlantic by Hudson Strait, which is over 400 miles long and 100 broad. James Bay is a large gulf in the south, and Chesterfield Inlet extends a long way west. Hudson Bay is remarkably free from islands and shoals, except in the extreme north and at the entrance of the strait. From the middle of June to the end of October the bay is

navigable, but there is much drift ice in the winter. Many rivers flow into the Bay, among them being the Churchill, the Nelson, and the Severn on the W., the Moore and the Albany in St James's Bay, and the Great Whale on the E. The western coast is for the most part level and comparatively fertile, the eastern is lofty. Not much fish is found in the bay, though the white whale is sometimes taken.

Hudson Bay Company, a joint-stock company founded in 1670 for the purpose of obtaining furs and skins from North America. The charter of incorporation granted by Charles II. conferred on Prince Rupert and his seventeen associates the sole right of trading in the waters within Hudson Straits, and on the contiguous coasts, a region which was held to include all lands watered by rivers flowing into Hudson Bay. At the same time the government of this territory, which was called Rupert's Land, was placed in their hands, and they were encouraged to extend their trading operations by a promise of the same special privileges in all lands into which they should penetrate "out of the limits or places aforesaid." In 1685 the English were deprived of most of their factories by the French, but they were restored by the Peace of Utrecht (1713), and the French were never able to regain them. The trade of the Company prospered from the first, but they were slow to explore the interior, and as late as 1749 their possessions consisted merely of four or five forts on the shore of Hudson Bay. After Canada became a part of the British dominions (1763), they suffered much from the competition of the North-West Fur Company of Montreal. In 1821 the two companies sank their differences and obtained a joint monopoly, which was to extend throughout all the district to the west and north of the original settlement and to last for twenty-one years. A new licence was granted in 1838 to the Hudson Bay Company alone. On its expiration in 1859 the monopoly ceased, excepting in the Company's original possessions. These, however, were sold to the British Government in 1869, and in 1870 they were incorporated in the Dominion of Canada. But the Company still retains a considerable quantity of land, especially in the neighbourhood of its numerous forts.

Hudson River is in the state of New York, United States of America, taking its rise in the northern part of the state, where its eastern and western branches have a course of 40 miles before uniting to flow 15 miles S.E. to Hadley Falls, then a rather longer distance N.E. to Glen's Falls, and then almost S. to New York Bay. Shortly below the junction of the streams the Sacandaga flows into the river, and 40 miles below Glen's Falls the Mohawk joins the stream. Many towns are upon the river, among them being New York, Albany, Hudson, Poughkeepsie, and Troy. The last 118 miles of the course of 350 miles are navigable for large vessels, and steamboats ply as far as Albany, 145 miles above the mouth. The scenery is often compared to that of the Rhine.

Hué is a town well fortified in the European style, about 10 miles above the mouth of the river Hué, which flows into the China Sea near the Gulf of Tonquin, and it is the capital of Anam. Besides the outer walls, five miles in extent, there is an inner citadel fortified with two walls, and containing the palace. Only small vessels can get over the bar at the river's mouth, where is a fort occupied by a French garrison, Hué also having a French resident.

Huelva, the name of a province and of a seaport town of Andalusia in Spain. The province, which is occupied in the north by branches of the Sierra Morena, is alluvial, and fertile in the south, and is rich in minerals, especially in copper, the working of which has been greatly developed of late. The town, which is 60 miles S.W. of Seville, is well built, and has some good squares, and has a brisk trade, especially in copper and other minerals, as well as in fruits and wines. Industries connected with shipping are also carried on. The value of the exports exceeds £5,000,000. A railway unites Huelva to Seville.

Huerta, VICENTE GARCIA DE LA (1730-87), a Spanish poet and critic, was born in Estremadura and, after a life of much adventure, settled down as head of the Royal Library. As a critic his efforts were turned to discouraging the Gallican tendencies of the time and to advocating a return to the old types of national literature, though he did not entirely carry these principles out in his own works. His best-known work is a tragedy, *Rachel*. He also wrote lyrical and other poems, and made a collection in 17 volumes of the Spanish Theatre.

Huesca, the name of a province and of a town of Aragon in Spain. The province is on the French frontier, and contains some of the loftiest peaks of the Pyrenees. The south is more level, and the province has abundant pastures. The area is almost 6,000 square miles. The town, on the right bank of the Isuela, is 35 miles N.E. of Saragossa, and has good streets and squares, a fine Gothic cathedral containing some paintings, an ancient royal palace, and a university.

Huet, PIERRE DANIEL (1630-1721), was born at Caen and educated at the Jesuit's College there. He became with Bossuet joint tutor to the Dauphin, and had a share in the production of the Delphin editions of the classics. Later he took orders, and became Bishop of Soissons and of Avranches successively, afterwards, however, resigning his bishopric, and died as abbot of Fontenay. Among his works were his *Memoirs* in Latin, a *History of the Commerce and Navigation of the Ancients*, and books upon theology, philosophy, and history.

Huggins, WILLIAM (b. 1824), English astronomer, early commenced the study of physical science. In 1852 he was elected member of the Microscopical Society, and a few years later devoted himself entirely to astronomy. He has made many important discoveries, and is a member of most of the scientific societies of England.

Hugh, St. (1135–1200), Bishop of Lincoln, was born at Avalon in Burgundy. His father, who was Lord of Avalon, became a monk, and the boy was educated in the monastery. He became deacon at the age of nineteen, and in 1160 he joined the Carthusian order. In 1175 Henry II. brought him to the Carthusian convent at Witham, and in 1186 made him bishop. St. Hugh often offended Henry by his sturdy opposition, but regained his favour by his *bonhomie* and tact. He was loyal to Richard, but made an important point in constitutional history by opposing the granting of a subsidy to the king. The bishop was present at the coronation of King John. He almost rebuilt Lincoln cathedral, and when, after his death, miracles were reported to be worked at his tomb, he became the St. Thomas of the north.

Hugh, St. (of Lincoln), (1245–55), was a boy who was said to have been put to death by Jews, and his body was found in a well where its presence was miraculously revealed. His body was taken to the cathedral, and some of the Jews said to be implicated were imprisoned and hanged.

Hughes, Sir Edward, English admiral, born about 1720, became a post-captain in 1748, after having already seen much service. In 1757 he commanded the *Somerset* in Boscawen's expedition against Louisbourg, and in 1758 in the expedition to Quebec. He was subsequently commodore in the East Indies, and after his promotion to flag-rank in 1778 became a K.B., and rear-admiral on that station. There he fought five actions with the French under Suffren, and distinguished himself as a tactician and organiser. He had in the meantime, in 1780, been made a vice-admiral, and in 1793 he was promoted to be admiral. He died in 1794.

Hughes, Thomas, born 1823, an English Q.C. and County Court Judge (1882), once Liberal member for Lambeth, is better known to most as the author of *Tom Brown's School Days*, and *Tom Brown at Oxford*, and *The Scouring of the White Horse*. Both in Parliament and out of it Mr. Hughes has made himself the advocate of many schemes for the advancement of the well-being of the working-classes, and he was one of the earliest promoters of the principle of co-operation in conjunction with Kingsley and F. D. Maurice.

Hugo, Victor Marie (1802–1885), a great French poet and novelist, was born at Besançon. His father, an officer, followed the fortunes of Joseph Bonaparte into Italy and Spain, being accompanied to these countries by his son, who displayed a taste for writing verses when only 12 years old. In 1823 he produced his first novel, *Han d'Islande*, and in 1828 a full edition of *Odes et Ballades*, having the year before brought out his play *Cromwell*, which gave the first impulse to the war between the Classicists and Romanticists, which culminated in the production of *Hernani* in 1830. Then followed many dramas such as *Marion Delorme*, *Le Roi s'amuse*, *Lucrèce Borgia*, *Marie Tudor*, *Ruy Blas*, etc. This work, however, did not exhaust his energies, for he published during this period the novel *Notre Dame de Paris*, and *Les*

Feuilles d'Automne, and other poems in his best style. He also wrote critical essays, and contributed to a review. He was admitted to the French Academy in 1841, and in 1845 Louis Philippe made him a peer of France. From 1848 to 1851 he was engaged in politics, at first on the Conservative side and then on the Democratic, and the *coup d'état* saw him flee to Brussels, where he wrote the first of his bitter attacks upon Napoleon III. He then went to Jersey and afterwards to Guernsey, where he remained till the establishment of the French Republic. It was during this period that some of his books best known to English readers were published. Such are *Les Misérables*, *Les Travailleurs de la Mer*, *L'Homme qui Rit*, and many of his later poems. Of the several works written after his return to France in 1870, perhaps the most notable is *L'Histoire d'un Crime*. Victor Hugo's faults seem to have lain in the direction of self-consciousness and exaggeration.

Huguenots, the former name of the members of the Protestant Church in France. The word is a corruption of the German *Eidgenossen*, "sworn confederates," and was imported from Geneva, where it was used as a political nickname. The French reformers were at first disposed to favour the views of Luther, but by the middle of the 16th century the movement had assumed a thoroughly Calvinistic character. As such it was bitterly opposed by the Court, and the persecutions to which the Huguenots were subjected drove them to take up arms in 1560. The ensuing struggle was due almost as much to political as to religious causes, especially in its later phases, for the adhesion of many of the discontented nobles and the thorough organisation of the party on a more or less democratic basis made it a grave source of political danger. The contest was continued intermittently for nearly forty years, war alternating with peace, according as to whether the royal party conceived that they had more to fear from the Huguenots or from their adversaries, the Guises (q.v.). Eight short wars are reckoned during this period, each terminated by a peace from which the Huguenots derived some temporary advantages. Their leaders were at first Louis de Bourbon, Prince de Condé (q.v.), and the Admiral Coligny (q.v.); after the death of the former at Jarnac in 1569, Henri, heir to the throne of Navarre, afterwards Henri IV. of France (q.v.), was put forward by his mother, Jeanne d'Albret, as their political champion. On one occasion, when the influence of the Guises was paramount, the Court party had recourse to treachery, but the massacre of St. Bartholomew (1572), terrible as were its immediate effects, failed altogether in its purpose of eradicating the Huguenots—perhaps the most serious injury it inflicted on them was the loss of their leader Coligny. The treaty of 1573, granting the Huguenots freedom of worship at Montauban, Nîmes, and La Rochelle was the model for numerous subsequent arrangements of the same kind, with the result that these places ultimately became Protestant strongholds. The Roman Catholic cause was apparently strengthened by the formation of the "Holy League" (1576),

but this association was really intended to promote the ambitious designs of the Guises, and with their fall it came to an end. The accession of Henri IV. seemed to promise a new era for the Huguenots, but the Edict of Nantes (1598) by no means satisfied their aspirations, as it did little more than repeat the provisions of some of the previous edicts. Peace was maintained during the reign of Henri, but under his son, Louis XIII., hostilities were again resumed. The efforts of the Huguenots to improve their position were, however, brought to a fatal close by the reduction of La Rochelle, after a gallant resistance, in 1629. From this time forward they were deprived of all military and political power, but contributed greatly to the material prosperity of France by their skill and industry in every department of trade. But Louis XIV., who in religious matters was influenced by the Jesuits, resumed a policy of persecution, and even before the revocation of the Edict of Nantes (1685) vast numbers of Huguenots had already left the country. Most of those who remained took refuge in the mountains of the Cevennes, where in 1704 they broke out into a rebellion which lasted for two years. [CAMISARDS.] In the 18th century a spirit of toleration grew up, which was gradually extended to the Huguenots, although it was not until 1789 that they regained their lost privileges. The Protestant Church of France now enjoys the same privileges as other religious bodies.

The Huguenot families which found a refuge from political and religious tyranny in England have exercised an important influence on her industrial history. In the reign of Elizabeth they settled in large numbers in London, Canterbury, Coventry, Southampton, and other towns. From the first they were allowed perfect liberty of worship. The Spitalfields silk industry grew up with the emigration which took place after the revocation of the Edict of Nantes. Among other industries for which England is specially indebted to the Huguenots may be mentioned those of linen, paper, clocks, glass, locks, and surgical instruments.

Huia, or NEW ZEALAND WOOD CROW (*Hetero-locha dentirostris*), a rare New Zealand bird, by some authorities classed as an aberrant crow, and by others as a starling. It is remarkable for the fact that the bills in the two sexes differ in shape and size; hence the male and the female were formerly reckoned as distinct species. The former uses his strong wedge-shaped bill to chisel away decayed wood, while the female, whose bill is slender and curved, picks out the larvæ, on which they feed, from their holes.

Hull, or KINGSTON-UPON-HULL, one of the chief ports of England, is a municipal and parliamentary borough (3 single-member divisions), in the East Riding of Yorkshire, and on the north shore of the Humber estuary, at the point where the river Hull falls into the estuary, 20 miles from the mouth of the Humber, and 34 miles S.E. of York. The town stands on low ground protected from the river by embankments, and is built mostly of brick. Among the principal public buildings are the old cruciform parish church of the Holy Trinity, with

many other churches and places of worship, the town-hall, the exchange, corn-exchange, Trinity house, dock offices, grammar school, free library, Hull and East Riding College, etc. Hull is served by five railway companies, and has a good railway station. There are three public parks, and 40 acres of botanic gardens, and among the objects of adornment are a Doric column in memory of Wilberforce, and statues of the Queen and Prince Consort. The great industry of Hull is connected with shipping, and the dock accommodation makes it the third port in the kingdom. There is a large coasting trade, and a brisk foreign trade with the Baltic, America, the Mediterranean and other places. The docks belonging to the Hull Dock Company comprise 140 acres, and there are also 40 acres of other docks, and graving-docks as well. The chief industries beyond those relating immediately to the docks are ship-building, iron-foundries, machine-shops, seed-crushing, cotton and flax mills, canvas, rope, and cable-making, and the manufacture of tobacco. Edward I. granted a charter to the town, and in 1359 it furnished 16 ships and 470 sailors. Both in the Civil War and in the Revolution Hull decided against the king, and the day of William III.'s proclamation at Hull is kept as a holiday. Among illustrious natives of the town was Andrew Marvell.

Hullah, JOHN, LL.D. (1812-84), an English music teacher and writer upon music, is generally looked on as the man who has done most to popularise music in England. He was born at Worcester, and learnt music from his mother. In 1832, after studying under William Horsley, he became a member of the Royal Academy of Music, and in 1836 he composed an opera, the words to which were by Charles Dickens. The next year he became organist at Croydon, and in 1840 he started a class at the Normal School, Battersea, which was followed up by many similar steps. He was appointed Musical Inspector of Training Schools, but paralysis in 1880 put an end to much of his active work. It was he who introduced Wilhelm's method into England. Among his productions are the songs *The Sands of Dee* and the *Three Fishers*, a *Grammar of Vocal Music*, and similar books, and he contributed to periodicals.

Hulsean Professorship and Lectureship, THE, in the university of Cambridge, were founded in 1789 by the will of the Rev. John Hulse, a graduate of St. John's College, who bequeathed his property in Cheshire for their support. The holders of the offices were originally termed the Christian Advocate and the Christian Preacher respectively. The subject of the four annual lectures is "The Evidence for Revealed Religion," or some kindred topic. The lectureship is held for a year.

Humane Society, THE. The purpose of this institution, established in London by thirty-four private gentlemen in 1774, is to restore animation in those who are apparently drowned. Amongst other efforts for this purpose it maintains boats with life-saving apparatus on the Serpentine in

Hyde Park with printed instructions as to the method to be pursued. It also distributes numerous medals and other awards for gallantry displayed in the endeavour to rescue life, especially in cases of drowning.

Humanitarians, in theology, are those who deny the divine nature of Christ. [UNITARIANS.] The name is also given to the St. Simonians and others whose aim is to perfect the human race by a reorganisation of society; to the adherents of Auguste Comte [POSITIVISM]; and to those who, from repugnance to inflict pain, support the abolition of capital punishment, etc.

Humber, THE, a river estuary on the east of England, between the counties of York on the north and Lincoln on the south. It is about 35 miles long, and has an average breadth of 2 to 3 miles, opening out at the eastern end to 6 miles, and drains a basin of nearly 10,000 miles, such being the extent of land drained by the Ouse, with its tributaries Aire and Derwent, the Don, the Trent, and lastly the Hull. From the entrance of the Ouse the direction taken by the estuary is W. by N., and from that point to Spurn Head, S.S.E. The chief ports are Hull, Goole, and Great Grimsby, and navigation is easy for large vessels as far upwards as Hull, and small vessels can ascend to Goole, 20 miles farther inland, while Great Grimsby is almost on the open sea opposite to Spurn Head. Many towns have been in the course of time swept away by encroachments of the sea, and are now represented by sands.

Humboldt, FRIEDRICH HEINRICH ALEXANDER VON (1769-1859), a great traveller and naturalist, was born at Berlin, and after studying at Göttingen and other universities, started on a tour down the Rhine, visiting France, Holland, and England. In 1791 he went to Freiberg to study mining and botany, and from then to 1797 he was engaged in mining operations, resigning his appointment in the latter year for the sake of travelling. Having gone to Paris he made the acquaintance of Aimé Bonpland, a medical and botanical student, and, having got from the King of Spain permission to travel in the Spanish Colonies of America, he sent for Bonpland, and the pair started from Corunna. At Teneriffe they climbed the Peak to make atmospherical and geological observations. For five years they explored the regions of the Orinoco and Rio Negro, verifying the union of the Orinoco and the Amazon, and then spent some months in Cuba. In 1801 they returned to South America, and ascended the Magdalena, then went by land to Quito and as far south as Lima, crossing the Andes five times, and climbing Chimborazo and other peaks, and after a visit to Mexico and the United States they arrived in France, and Humboldt set about arranging the vast mass of materials they had brought with them, and, with the exception of short intervals, he remained there till 1827. His work on South America was published in three volumes, with atlas, from 1809 to 1825. In 1829 he set out in company with Ehrenberg and Gustav Rose on an exploring

expedition to Northern Asia, to examine the Ural and Altai mountains and the Caspian Sea, accomplishing 10,000 miles in nine months, and the results of this expedition, published by Rose and himself independently, gave a great impulse to research among men of science. For some years from this time Humboldt was engaged largely in political and court affairs, but he found time to publish a critical examination of the geography of the New World. His great work *Kosmos*, in four volumes, had a great influence upon science, and has been often translated. Bohn's *Scientific Library* contains in nine volumes translations of his *Travels*, *Kosmos*, and *Views of Nature*.

Humboldt, KARL WILHELM VON (1767-1835), brother of Alexander von Humboldt, German politician and author, was born at Berlin, where, as well as at the university of Göttingen, he studied law, and also gave attention to the philosophy of Kant, to antiquities, and the philosophy of art. He formed a friendship with Schiller, and published after the poet's death a correspondence that had passed between them. In 1801 his literary and artistic pursuits were to some extent interrupted by diplomatic work, and from 1806-8 he was minister-plenipotentiary at Rome. He then returned to Berlin as Minister of the Interior in matters touching religion and education, and had much to do with the founding of the Berlin University; but, being appointed ambassador to Vienna in 1810, he was for some years busied about the events which were leading to the growth of Prussian greatness. From 1819 he lived chiefly in retirement upon his estate, and gave himself freely to study. His collected works were published at Berlin in seven volumes (1841-43), and consist of poems, essays on divers matters, and treatises on language. His essay on *The Sphere and Duties of Government* is one of the earliest and most spirited defences of "individualism" or "*Laissez Faire*" in politics as against paternal government.

Hume, DAVID (1711-76), historian and philosopher, was born in Berwickshire, and, having been brought up under a clever mother, entered the Edinburgh University. He abandoned the law, which was distasteful to him, for philosophy and classics, and read steadily English, French, Latin, and Italian literature. In 1734 he went to France, and while residing there he wrote his essay upon miracles. On his return to England he published a philosophical work, the *Treatise on Human Nature*, his most important philosophical work. It fell dead, but two volumes of *Moral and Political Essays*, published in 1741-42, had a greater amount of success. For a time he was tutor to the Marquis of Annandale, and he became candidate for the chair of moral philosophy at Edinburgh and for that of logic at Glasgow, but in each case failed. He then became secretary to General Sinclair, and in 1751 went to London, and in 1752 published *Political Discourses*, which were well received. These contained the germ of the Free Trade doctrine. In 1752 his appointment as librarian to the Faculty of Advocates gave him the idea of writing history. The first volume, treating of the reign of James I. and Charles I.,

appeared in 1754, and in 1756 the second volume, covering the period between the beginning of the Civil War and the Revolution. He then published two volumes on the Tudor period. The book gave offence by its support of Absolutism, but was for long a standard work. The money from his books, and a pension from the Crown, enabled him to spend the latter part of his life in learned leisure, varied by a visit to France as secretary to the ambassador Lord Hertford, during which visit he was made much of by French society. For ten years he remained there, and afterwards was Secretary of State for two years under General Conway, retiring then finally to Edinburgh. In philosophy Hume is an extreme sceptic, with a tendency (in the *Essays*) to a point of view like that of modern Positivism. On the one side his scepticism "woke Kant from his dogmatic slumber," on the other he anticipated J. S. Mill in many points. His *Treatise on Human Nature* and his *Moral, Political and Literary Essays* were re-edited in 1874 by T. H. Green and T. H. Grose.

Hume, JOSEPH (1777-1855), a political and financial reformer, was born at Montrose. He was brought up to the medical profession, and made his studies at Edinburgh. He obtained an appointment as assistant ship's surgeon in the East India Company's service in 1797. He worked hard at Eastern languages, and in the Mahratta War acted as Persian interpreter in Lord Lake's army, besides doing medical duties, and filling other posts. Having thus accumulated a moderate fortune, he returned to Europe, and after an extensive foreign tour sat for a short time in Parliament. Losing his seat, and failing to become, as he desired, a director of the East India Company, he turned his energies to social reforms. Returned for the Aberdeen burghs, he attacked vigorously corruption and other abuses, and, though having no powers as an orator, he managed by his statistical knowledge and other qualities to obtain the respect of all parties during his chequered and somewhat intermittent parliamentary career.

Humerus, the bone of the fore-arm.

Hummel, JOHN NEPOMUK (1778-1837), musical composer and performer, was born at Presburg. He received his early education in music from his father, and was then trained by Mozart. At 10 years of age he accompanied his father on musical tours, and before the end of the century had composed several sonatas, trios, etc. He was then choir-master for a time to Prince Esterhazy, and made essays in a more ambitious style of composition. In 1816 he appeared in public as a pianist, and soon won fame, especially by his great powers as an improvisator. The latter part of his life was spent chiefly at Weimar, though he made foreign musical tours from time to time.

Humming Bird—so named from the noise made by the rapid motion of the wings—any species or individual of the Linnæan genus *Trochilus*, now raised to the rank of a family, *Trochilidæ* (=Huxley's group *Trochilomorphæ*), and constituting, with the Swifts, the group *Macrochires*, from the

extraordinary development of that portion of the wing corresponding to the mammalian hand (*manus*). These birds, remarkable for their diminutive size and, generally, gorgeous metallic plumage, are confined to the New World, ranging northward from Tierra del Fuego to the island of



HUMMING BIRD.

Sitka, and ascending from the lowlands near the coasts to an altitude of 16,000 feet in the Andes. But by far the greater number of the more than 400 known species are found in the tropical forest-regions, whither those from the extreme north and south retreat when the short summer of the high latitudes comes to an end. The bill is slender, and in most cases long; the tongue is protrusile, bifid at the tip, and admirably adapted for procuring the food, which consists principally of insects, supplemented by the nectar of flowers. though Wallace (*Amazon*, ch. v.) says that "they often take them [insects] on the wing like any other fissirostral bird." The wings, with ten primaries, are narrow and pointed, and worked by enormously developed pectoral muscles, the breast-bone being abnormally large to allow of their attachment. The tail, of ten feathers, varies greatly, and is often ornamented with plumes, sometimes with a racket-shaped web at the top. The feet are small and weak, and unfitted for progression on the ground. The skins form an important article of commerce, and are exported in vast numbers from Brazil to North America and Europe. The best collection of humming birds in the world is that at the Natural History Museum, South Kensington, acquired, with a number of unmounted skins, from the executors of the late John Gould, F.R.S. It furnished the material for Gould's great work (in five folio volumes) on the Humming Birds, and contains most of the specimens from which the magnificent plates were drawn.

Humus, or vegetable soil, is a dark-coloured loam containing the results of the decay of vegetable matter. Sometimes, as in the black earth of Russia, it may contain six or ten per cent. of organic matter, and it may cover thousands of square miles, as in the American prairies. It is very valuable for agricultural purposes, and in India is known as

cotton soil. Geologically, humus is interesting as furnishing a group of little-known but most active *humus acids*, to which the names *humic*, *ulmic*, *crenic*, and *apocrenic acid* have been applied, though it is doubtful whether they have been isolated. These acids have (1) a powerful solvent effect upon alkalies, alkaline earths, and even silica: they have (2) a great affinity for oxygen, and thus reduce peroxides to protoxides or to native metal, and sulphates to sulphides; and (3), possibly by neutralising alkaline solutions, they bring about the precipitation of silica, especially in or around organic structures, as in the formation of silicified wood, and possibly of flint. Much of the solvent action attributed to carbonic acid, because it results in the formation of carbonates, is probably due to them. The red, brown, or yellow peroxide of iron colouring many sandstones, is by them often converted into ferrous oxide and then removed as carbonate, bleaching the rock or, in intermediate stages, forming layers of lilac sand, such as are often seen under heathy moorland. Copper-ores in contact with decaying wood, or decomposing fish, have been reduced to native copper: native silver has been similarly formed; and gypsum has been converted first into calcium-sulphide, then into calcium-carbonate and sulphuretted hydrogen, and finally into layers of limestone and native sulphur.

Hundred, Hundredors. A hundred is a district forming part of a county, and governed by a High Constable or bailiff, and originally so called because each consisted of a hundred families of freeholders or ten tithings. A Hundred Court is much the same as a Court Baron, only that it is larger, and is held for the inhabitants of a particular hundred instead of a Manor; it resembles a Court Baron in not being a Court of Record, and in the free suitors being the Judges and the Steward the Registrar. Hundredors are persons empanelled or fit to be empanelled on a jury upon a controversy arising within the hundred where the land in question lies. The word "hundredor" also sometimes signifies he who has the jurisdiction of a hundred, and holds the Hundred Court, and sometimes it is used for the bailiff of a hundred. [CONSTABLE, TITHING.]

Hungary, a country of Europe lying between long. 16° and 26° E. and lat. 44° 30' and 49° 40' N., corresponds pretty nearly to the ancient Pannonia (W.) and Dacia (E. of the Danube). It takes its modern name from the Huns, who here made their first settlement within the Roman Empire. They were followed by the Avars (q.v.), a kindred tribe. Then for a time the district formed part of the Slavonic kingdom of Moravia, until about the beginning of the 6th century another Tartar tribe, the Magyars, appeared, and under their leader Arpad, by the middle of the century, had destroyed the Moravian power. They made, indeed, several attempts to push farther westward, but they were finally checked by the battle of Augsburg in 955. Under their king Geiza (972-97) their change from a nomad horde to a settled nation seems to have been completed, and they became

fixed in the country which they have ever since occupied. Geiza's second wife, a Polish princess, had been converted to Christianity; she persuaded her husband to be baptised, and about 994 his son received the name of Stephen. This prince, succeeding in 997, quickly spread Christianity throughout his dominions, and placed the kingdom under the patronage of the Pope. Since his time the kings of Hungary have always borne the title of "Apostolic Majesty." Stephen was also a lawgiver, and in every way the first civiliser of Hungary, and has since been honoured as a saint. Under Ladislas, also called "the Saint" (1077-95), further laws were enacted, and the first steps taken towards the annexation of Croatia, which came about in 1102 under his nephew and successor Koloman. Since that time Croatia (q.v.), though autonomous, has always been subject to the king of Hungary, holding, indeed, very much the same relation to that kingdom as Hungary itself has since 1526 done to Austria. During the reign of Geiza II. (1141-61) occurred the arrival of the Saxon colonists, whose descendants still occupy a large part of Transylvania. In this century, too, Hungary became engaged in foreign wars, against Galicia on one side and Venice on the other. From the partial submission of Galicia to Bela III. (1173-96) dates the claim made by Austria to that territory at the time of the partition of Poland. Against Venice the Magyar kingdom was less successful, and ultimately the town of Zara was lost. Under Andrew II. (1205-35) the kingdom fell into disorder. During his absence on crusade the power of the nobles and clergy had increased, and finally in 1222 Andrew, after an attempt to make all honours and offices hereditary, enacted what is known as the "Golden Bull," which fixes the privileges and rights of the nobles and landowners in terms often resembling those of our own Great Charter, but going further in recognising a right of rebellion in the subjects in the event of its violation by the sovereign. In the reign of Andrew's successor, Bela IV. (1235-72), yet another Mongol invasion took place, and Hungary suffered terribly. Frederick II., Duke of Austria, took advantage of this to extort three counties from Bela; but on the retirement of the barbarians Bela met, defeated, and slew Frederick in battle, but presently was worsted in a war with Bohemia. In 1278, however, Hungary had her revenge, and in alliance with Rudolf of Hapsburg, now Duke of Austria, and Emperor-elect, severely defeated Bohemia at the Marchfeld. With Andrew III. (d. 1301) the House of Arpad came to an end, and the crown of Hungary passed to a prince of Anjou, Charles Robert, son to Charles II., King of Naples, by Mary, daughter of Stephen V. He had some difficulty in establishing himself, but before the end of his long reign was not only firmly settled on the throne, but had much increased the importance of Hungary in European politics. His son Lewis (1342-82) succeeded in acquiring the crown of Poland as well, but as he died without a son, the Angevin dynasty ended with him. One of his daughters, Mary, had married

Sigismund of Luxemburg, and was duly crowned "king" (a term long remembered by the Magyars) of Hungary. Ultimately the Diet associated her husband with her in the office. He reigned for 55 years. During this time the Turks first became a pressing danger to Eastern Europe, and in 1396 the Hungarians and French in alliance suffered defeat at Nicopolis. It was in view of operations against the Turks that the light cavalry called Huszars (from husz—twenty, every twentieth man being conscribed) were first levied. In this reign, too, the system of representative government which has ever since prevailed in Hungary was first settled. Each county sent four representatives, who, with those from the cities, composed the Lower House. The Upper consisted of nobles, spiritual and temporal. The election of Sigismund to the empire in 1411, and his accession to the throne of Bohemia in 1419, were injurious to Hungary—the former as tending to merge her in Germany, the latter as mixing her up with the Hussite troubles at a time when the pressure of the Turks on her eastern frontier called for her undivided energies. Sigismund was succeeded by his daughter, Elizabeth, wife to Albert, Duke of Austria; but Austria had not yet secured the sovereignty. Albert died in the following year, and, though a posthumous son was born, he was set aside in favour of Ladislas Jagellon, King of Poland. By the aid of the great John Hunyadi (q.v.) Ladislas waged a successful war for some years against the Turks, recovering some territory for Christendom, but was defeated and slain at Varna in 1444. Albert's young son Ladislas "the Posthumous" was now elected, but the Austrians refused to give him up, and Hunyadi was appointed governor of the kingdom. Defeated by the Turks at Kossovo in 1448, he won a great victory over them at Belgrade in 1456, but died shortly afterwards. Two years later, on the death of Ladislas, Matthias, son of John, known to history as Matthias Corvinus, was elected king. He was successful both against the Turk and against the Emperor, and did much both as lawgiver and as a promoter of art and culture. He died in 1490, leaving no heir, and again a Ladislas of the house of Jagellon—this time, however, a king of Bohemia—was elected. Under him and his son Lewis (1516–26) the decay of Hungary began. Territory was lost on all sides, insurrection arose. Solyman the Magnificent captured Belgrade finally in 1521, and in 1526 Lewis himself perished in the battle of Mohacs, and Hungary as an independent kingdom ceased to exist. By the engagement in 1515 of the Emperor Maximilian's grandchildren Ferdinand and Mary to Anne and Lewis, daughter and son of Ladislas, the crown of St. Stephen passed to the ducal house of Austria (q.v.), and from the battle of Mohacs the head of the Hapsburgs has been king of Hungary and Bohemia. At the same time the relations between the Magyars and their German rulers have rarely been amicable. The former, used to constitutional sovereigns, were not disposed to acquiesce in Hapsburg autocracy. Several attempts were made at first to set up a native sovereign; and at least twice in the two

centuries following the union of the crowns Hungary sought the alliance of the Turks against Austria. Fresh difficulties arose as the Slavonic peoples gained strength, for the Magyar aristocracy have always been as slow to recognise the rights and aspirations of other nations as they have been forward to demand the recognition of their own. Maria Theresa (1717–1780) succeeded, partly by awakening the chivalrous feelings of the race, partly by her own ability and statecraft, in keeping Hungary loyal. During the Napoleonic period the Hungarians fought on the side of Austria, but when the national spirit revived in Europe it was not long before the demand for constitutional government was renewed. In 1848–9 war went on, and the Hungarian resistance was only put down by the help of Russia. After eighteen years more, during which the disaffection of Hungary had been a constant source of weakness to Austria, Francis Joseph was crowned at Buda, and since that time has governed Hungary as a constitutional sovereign.

Ethnology. Hungary is inhabited by so many distinct peoples, each speaking its own language and, to a large extent, retaining its own customs, that the term Hungarian is destitute of any ethnological sense; it simply means a native of Hungary, irrespective of his racial affinities. The dominant people, both politically and numerically, are the *Magyars*, of Finnish descent, who occupy all the provinces west of the Danube as well as the Puszta, or great central plain watered by the river Theiss. Next in numerical importance are the various populations of Slav origin, who form altogether five distinct groups. The *Sloraks* and *Ruthenians* (*Rusniaks* or *Little Russians*) in the north along the slopes of the Carpathians, the *Serbs*, *Wends*, and *Croatians* in the south, and especially in the valleys of the rivers flowing to the Danube. The third place, if not in point of numbers, at least in social importance, is taken by the *Germans*, who form large communities in all the towns, and who constitute the bulk of the population in Transylvania, where they take the name of Saxons. Next follow the *Wallachians* (*Roumanians*), numerous especially in Bukovina and in the eastern departments generally. To these must be added the Jews, who form compact communities in many districts, several small groups of peoples such as the Kumans, Yazyghes, and Szeklers of Transylvania, akin to the Magyars; lastly the Gypsies, Armenians, and others.

Huns, a Mongol people, probably identical with the Hiong-nu of Chinese records, who harassed the north frontier of China from the second century before to the second century after the new era, and who later (5th century) were led by Attila across Asia and Europe as far west as Châlons-sur-Marne. That the great bulk of Attila's hordes were Mongols, or Mongolo-Tartars, is evident from the contemporary descriptions of these ferocious warriors, and of Attila himself, whom Priscus describes as a man of low stature, broad chest, disproportionately large head, small eyes, with scant beard, flat nose, dark complexion. But there can be no doubt that many other peoples, and especially Ugrian Finns, helped to swell the ranks of Attila's armies, so that

the term *Hun* has ceased to possess any clear or definite ethnological meaning.

Hunt, JAMES HENRY LEIGH (1785–1859), an English poet, author, and journalist, was born near London, and received his education at Christ's Hospital, of which he was a Grecian at the time of his leaving. Entering at first into the office of his brother, who was an attorney, he afterwards had a post in the War Office, where he remained till 1808, having already published some poems and contributed to his brother's paper, *The News*. In 1808 he, with his brother, started the Liberal paper, *The Examiner*, and the fearlessness of the brothers in its conduct brought them under the arm of the law. They were prosecuted and tried before Lord Ellenborough for an article against flogging in the navy. Mr. Brougham defended them, and the trial resulted in an acquittal. A second trial in 1812 for an attack upon the Prince Regent brought them a fine of £500 and two years' imprisonment. Leigh Hunt's cell became a literary centre, and he appears to have had a comfortable time in it. Several of his works were written at this period, one of these being the *Story of Rimini*, which was ridiculed by Theodore Hook and others. In 1818 Hunt published a volume of original poems and translations, and in 1819 began a series of some of his best essays in the *Spectator*, a weekly paper then started. In 1822 he went to Italy to join Byron and Shelley in order to concert with them the scheme of a paper to be called the *Liberal*. Soon after Hunt's arrival Shelley was drowned; the paper only survived a few months, and Byron and Hunt parted, the latter living for some years in Italy. In 1847 the Liberal Government gave him a pension of £200. As a poet he excelled in word-painting to the point of exaggeration, and his prose style was easy and graceful. He was editor of various papers, and contributed much to periodicals. Among his more important works, which were very numerous, may be cited his *Autobiography*, *Table Talk*, *Legend of Florence* (drama), and *A Jar of Honey from Mount Hybla*. He also published editions of many of the older English dramatists, and one of Sheridan.

Hunt, WILLIAM HENRY, (1790–1864), an English water-colour painter, was born in London, and was a fellow pupil of John Linnell. He began to exhibit at the Royal Academy in 1807. Among his works are the *Boy Before and After the Mutton Pie*, a *Study in Gold*, a *Study in Rose Grey*, and *Too Hot*.

Hunt, WILLIAM HOLMAN, born 1827, a renowned English painter, made his studies at the school of the Royal Academy, and began to exhibit in 1846. Belonging to the Pre-Raphaelite school, he had a great circle of admirers. His *Claudio and Isabella* (1853) made a great sensation, and was followed the next year by the *Light of the World*, perhaps the most widely-known and admired of all his pictures. He then turned his attention to Eastern subjects, the most valued of his works in this direction being *The Scapegoat* (1856), the

Finding of the Saviour (1860), and the *Shadow of the Cross* (1873).

Hunter, JOHN (1728–93), celebrated anatomist, surgeon, and physiologist, was born in Lanarkshire. It was not till his twentieth year that he took a post as assistant anatomist to his brother William, then a surgeon practising in London. He showed so much talent, and studied pathology with such effect at Chelsea Hospital, that in 1750 he could take his brother's place in the dissecting-room. In 1754 he entered as a pupil in St. George's Hospital, and, after holding the post there of house-surgeon, became a partner in 1755 in his brother's anatomical school, where he lectured for some years; his lectures being distinguished for their profound anatomical knowledge rather than for their style, since his early education had been neglected. For his researches into comparative anatomy he was diligent in dissecting animals that died in menageries. He also experimented on living animals. In 1761 he went as staff-surgeon with the army to Belle Île and to Portugal, gaining valuable experience in the treatment of gunshot wounds. In 1763 he set up in practice as a surgeon in London, and lectured in anatomy and surgery, but his greatest efforts were applied to the investigations, which an appointment in 1768, as surgeon to St. George's Hospital, and the consequent influx of paying pupils, enabled him to carry out more fully. Among his pupils were Jenner, and Sir Everard Home, afterwards his brother-in-law. In his later years he suffered greatly from heart disease, which interrupted his labours and eventually killed him. In 1776 he was appointed surgeon-extraordinary to the king, and in 1790 inspector-general of hospitals and surgeon-general to the army. Three years later the emotion consequent upon a dispute at a meeting of governors of his hospital killed him. He is best known to later times by his magnificent museum, now in the College of Surgeons, containing upwards of 10,000 preparations illustrating various branches of his science. He never finished a catalogue of it which he had begun, and after his death many of his papers were burnt by Sir Everard Home, for what reason is not clear. Among his more important writings are a *Natural History of the Human Teeth*, a *Treatise on Venereal Disease*, and a *Treatise on the Blood, Inflammation and Gunshot Wounds*. His works were collected and published in 1835.

Hunter, JOHN, naval officer, navigator, and statesman, was born in 1738. He entered the navy in 1754. He served as master of Howe's flagship during the American War. In 1786 he was appointed second captain of the *Sirius*, for the expedition to establish a colony in New South Wales. Hunter was made Governor of New South Wales in 1795, and remained in New South Wales until 1801. He died a vice-admiral in 1820.

Hunter, WILLIAM, M.D. (1718–1783), brother of the above, was born in Lanarkshire, and for some time studied theology at Glasgow University, abandoning this, however, later for medicine. In

1741 he went to London studying first under Dr. Smellie, then under Dr. Douglas, and attending St. George's Hospital as a pupil. In 1747 he became M.R.C.S., and began to practise, soon, however, confining himself almost entirely to midwifery, in which he was pre-eminent. He was appointed professor of anatomy to the Royal Academy upon its foundation in 1768. He collected a fine museum of anatomical preparations, shells, corals, and other objects of natural history, and some paintings, all of which was bequeathed to the university of Glasgow. Among his works are a *History of an Aneurism of the Aorta*, the *Anatomy of the Human Gravid Uterus*, and *Two Introductory Lectures*.

Hunter, SIR WILLIAM, a noted statistician, was born in 1840, and was educated at Glasgow, Paris, and Bonn. In 1863 he entered the Indian Civil Service, and was (1866-69) superintendent of public instruction in Orissa. In 1868 appeared his *Annals of Rural Bengal*, and he wrote a *Comparative Dictionary* of non-Aryan languages. In 1871 he was made Director-General of the Statistical Department of India, and in 1878 was knighted. He has written a *Life of Lord Mayo*, a *Gazetteer of India*, and several other works, and edited a series of books called *Rulers of India*.

Huntingdon, an inland county of England, lies between Northamptonshire and Cambridgeshire, which close it in on the N.E. and W., and has Bedfordshire to the S., and is watered by the Ouse. Its area is 229,515 acres, and in the N. it is very level, much of it belonging to the Fen district, but the surface varies somewhat in the W. and S. The soil is generally loam with clay and gravel, and is not particularly fertile, except on the meadow-lands, which are renowned for their richness. The agricultural farming is good, but there is little dairy-farming, and nothing remarkable about the breeds of sheep or cattle. The agriculture is improving, and several of the remaining lakes have been drained. Once part of Mercia, the county was forest, though little timber now remains, and remained for a long time under forest-laws. It returns two members to Parliament, being divided for this purpose into north and south. HUNTINGDON, the capital, is about 60 miles N. of London, on the left bank of the Ouse, the site sloping down to the river. There are two fine old churches, and a large market-place, and the Great Northern Railway has a station. The corn and wool trade occupy many, and there are breweries, an iron-foundry, brickworks, and oil mills. Huntingdon was the birth-place of Oliver Cromwell.

Huntingdon, HENRY OF (12th century), an English chronicler and author of the *Historiæ Anglorum*, was made Archdeacon of Huntingdon in 1120. His history extends to 1154. He also wrote some poems and letters on historical matters.

Huntingdon, SELINA, COUNTESS OF (1707-1791), a noted religionist of her time, who warmly advocated the principles of Methodism, patronised George Whitefield, whom she appointed her chaplain, and gave her name to the followers of that

preacher. She founded a college in Wales, and built many chapels. Her father was Earl Ferrers, and her husband left her a widow in 1746.

Hunyadi, JOHN CORVINUS, a noted Regent of Hungary and general (d. 1456), was born in Wallachia. Having married a rich heiress he became a man of mark, and was chief of the party which bestowed the crown of Hungary upon Ladislas of Poland (1440). Ladislas made him Voyvode of Transylvania and commander of the southern provinces, in which capacity he carried on a successful warfare against the Turks, and concluded the peace of Szegedin in 1444, the breaking of which by Ladislas in the same year cost that king his life at the battle of Varna. After being defeated by the Turks at a later period, and captured by the ruler of Servia, who lost his ransom through the intervention of the Pope, Hunyadi was appointed for a second time (the first having been in 1445 after the battle of Varna) Regent of Hungary in 1452, and in 1455 drove the Turks across the Danube. In 1456 he defended Belgrade against Mahomet II., who was compelled to raise the siege, but a pestilence in his army forced Hunyadi to retreat, and was the cause of his death at Semlin.

Huon of Bordeaux, a romance belonging to the cycle in which Charlemagne appears as the central figure. Huon, Duke of Guienne, who is to suffer death because, in self-defence, he has slain a son of Charlemagne, receives a promise of pardon if he can make his way to Bagdad, kiss the emir's daughter, and return with his teeth and beard. With the aid of the dwarf Oberon and the princess Esclarmonde herself, who falls in love with him, he performs these exploits. The oldest version extant is in prose, and dates from 1454.

Hurd, RICHARD (1720-1808), an English bishop and author, was born at Congreve, in Staffordshire, and educated at Emanuel College, Cambridge, of which society he became fellow in 1742. His earlier works were editions of the *Ars Poetica* and other classics, and in 1757 he criticised Hume's *Essay on the Natural History of Religion*. He also wrote *Moral and Political Dialogues*, and *Letters on Chivalry and Romance*, and in 1772 he published his *Warburton Lectures*, delivered at Lincoln's Inn, under the title of "Introduction to the Study of the Prophecies concerning the Christian Church." He also published an edition of Bishop Warburton's works and Warburton's correspondence. In 1775 he was made Bishop of Lichfield, and was translated to Worcester in 1781.

Hurdygurdy, a musical instrument somewhat resembling a lute in form. It has four or six strings of wire or catgut, which are fastened to screw-pegs at the head. Two of these extend over the sounding board to the tail-piece, their sound being produced through the revolutions of a wooden wheel with a handle, which the player grasps in his right hand. The other strings are tuned as drones. The compass of the hurdygurdy is two octaves upwards from the tenor G. It was in use amongst the peasantry of several European countries during the Middle Ages.

Huron, LAKE, one of the five great lakes of North America, is bounded by Canada on the N., S., and E., and on the W. by the United States. It is 218 miles long from N. to S., and is 180 miles broad in its widest part, but the southern arm which receives the waters of the St. Clair river is only about 60 miles in the widest part. The large island of Manitoulin, which is the largest island of the lake and is 100 miles long, with a breadth varying from 4 to 25 miles, is inhabited. A part of the lake is cut off by this island and by a peninsula running up from the S. and ending in Cape Hurd. Georgian Bay, as this part is called, contains numerous islands, but none of any great size, while some are little more than dots. Lake Huron is fed by Lakes Michigan and Superior, and itself flows by the St. Clair river into Lake St. Clair, and from that by the Detroit river into Lake Erie.

Huronian, the name applied to a vast system of rocks occurring in the neighbourhood of Lake Huron. They rest unconformably upon the Laurentian (q.v.), and are older than the Potsdam or Lower Cambrian. They are from 10,000 ft. to 20,000 ft. in thickness, and consist of quartzites, greenish chloritic slates with conglomerates containing pebbles of Laurentian rocks, limestones—one band, north of the lake, being 300 ft. thick—and intercalated greenstones. No fossils have as yet been detected in them.

Hurons, an extinct North American people, whose name still survives in Lake Huron, on the shores of which they formerly dwelt. The Hurons were a branch of the Wyandot (Iroquois) family, but were at no time members of the Iroquois confederacy. On the contrary, they lived in constant warfare with the "six nations," by whom they were at last exterminated or dispersed in 1656; some are said still to survive amongst the Wyandots now settled in Quapaw Reserve, Indian Territory, and in other reservations in Kansas. The Huron language appears to have been the same as that of the kindred Erie nation, and differed considerably from the other Iroquois dialects.

Hurricane, any violent storm of wind, especially a circular one as experienced in the tropics. The velocity of the wind on these occasions sometimes reaches 120 miles an hour. According to the accepted Beaufort Notation, a hurricane has a force of 12, and the wind has a minimum velocity of 100 miles an hour, with a pressure of 49·2 lbs. per square foot. The fall of the barometer ranges from 1·0 to 2·5 inches, the rapidity of the fall increasing as the centre of the storm approaches. In hurricane districts any fall greater than ·35 inch may be regarded as a sure warning of approaching danger.

Hurstmonceux, or HURSTMONCEAUX, is a village in Sussex, five miles north of Pevensey. Many excursionists from Eastbourne and Hastings visit the ruins of the fine castle, built by Sir Roger de Fiennes, one of the heroes of Agincourt, which passed (1727) into the hands of the Hare family, and was dismantled about 1800. Archdeacon Hare (rector 1832–55) lies buried in the churchyard.

The church, Early English, with Perpendicular windows, contains an altar-tomb of the second Lord Dacre.

Huskisson, WILLIAM (1770–1830), a prominent English statesman, was born in 1770, and in 1783 went to Paris to study medicine. He took part in the storming of the Bastille. In 1792 he returned to England, and entered political life as a supporter of Canning and Pitt. He was member for several constituencies. In 1814 he was Commissioner of the Woods and Forests; in 1822 President of the Board of Trade; in 1827 Secretary of State for the Colonies, and in 1828 Secretary of State for Foreign Affairs. Many restrictions on the trade of the colonies with foreign countries and many import duties were removed through him, so that he did much to prepare the way for Free Trade. He was run down by an engine at the opening of the Liverpool and Manchester Railway, and soon succumbed to the injuries received.

Huss, JOHN (1369–1415), the great Wyclifite reformer of Bohemia, was born at Hussinecz (whence his surname Huss), near Prackaticz. He studied at the newly-established university of Prague, where he took the degree of Bachelor of Arts (1393), and Master of Arts three years later, and began to lecture in 1398. He became preacher at the Bethlehem chapel in Prague, 1402, and soon attracted attention by his bold assertion of the doctrines of Wyclif and his denunciation of ecclesiastical abuses, becoming popular with the commonalty and attracting some of the nobility. In 1403 he was elected rector of Prague University. At first Archbishop Sbinko was inclined to tolerate the plain speaking of the zealot, who, however, became an object of hatred and terror to the clergy, so that in 1408 he was deprived and suspended, and in 1410 excommunicated, while copies of Wyclif's writings were publicly burned in Prague. But in 1409 the Bohemian "nation" at the university had upheld King Wenceslas against the foreign "nations," with the result that the Bohemians received by royal edict thrice as much voting power as the rest, who accordingly withdrew from Prague, while Huss earned the protection of King Wenceslas. He therefore went on preaching and teaching in spite of renewed excommunications (1411, 1412), and a Papal interdict which was issued in 1413, as a retort to Huss's condemnation of the Bull published by Pope John XXIII., instigating a crusade against King Ladislas. In 1414 he was summoned before the Council of Constance, and, having obtained a safe conduct through the influence of King Wenceslas, he set out on the fatal journey, October 14th of that year, reaching Constance November 3rd. It was not thought obligatory to keep faith with a heretic, so that, in spite of his safe conduct, he was apprehended (November 28th) and thrown into prison. His accusers exhibited 39 articles against him, and in a full sitting of the council under the presidency of the Emperor (July 6, 1415), it was finally resolved that Huss had erred in all the points urged against him and that he must abjure his

errors and make a public recantation. As he stoutly refused to acknowledge that he had erred, he suffered death at the stake as a heretic, as did in the following year his friend and adherent Jerome of Prague.

Hussars, light cavalry troops marked by the peculiarity of their dress, the most conspicuous feature of which is the busby, a high fur cap, with a cloth bag hanging out of the top, on the right side. The name (Hungarian *huszár*, "twentieth") arose from the fact that when they were first raised by Matthias Corvinus, King of Hungary, in 1458, every twentieth man was taken from each village.

Hutcheson, DR. FRANCIS (1694–1747), a distinguished metaphysician of the Shaftesbury school, was the son of a Presbyterian minister in the north of Ireland. In 1710 he entered the university of Glasgow, where he studied Latin, Greek, and general literature, and then theology. On his return to Ireland he opened an academy in Dublin. The issue of his *Inquiry into the Original of our Ideas of Beauty and Virtue* gained him high repute, and returning in 1729 to Glasgow as professor of moral philosophy, he proved a very successful lecturer. He is the best known upholder of the doctrine that moral and æsthetic distinctions are perceived by an innate "sense." His most important work, *A System of Moral Philosophy*, was published in 1755 by his son, FRANCIS HUTCHESON, M.D.

Hutchinson, JOHN (1674–1737), philosopher and theologian, born at Spennythorn, in Yorkshire, began his career as steward or agent to sundry peers, but was rendered independent by the Duke of Somerset that he might study physics (especially geology) and divinity. He became the founder of a sect or party which included Bishop Horne. He was a strenuous opponent of Newton's theories on vacuum and gravitation, the principles of his "Scripture Philosophy" being a *plenum* and air, while he ventured on a physical explanation of the doctrine of the Trinity. He founded the collection of fossils now known as the Woodwardian, belonging to the university of Cambridge.

Hutten, JACOB, a Silesian Protestant of the sixteenth century, was founder of an Anabaptist sect called Moravian Brethren. He advocated perfect equality, and was persecuted for his declamations against the authorities. He is said to have been burnt at Innsbruck; but the evidence is not conclusive. By degrees his sect entered into communion with the Swiss Church, and in 1627 became one with it. Later on the members of a sect founded by Count Zinzendorff, pretended to be their descendants, and took their title, *unitas fratrum*; but the connection is very doubtful.

Hutten, ULRICH VON (1488–1523), son of a Franconian knight, born near Fulda, where he was educated in a Benedictine monastery. From 1504–1514 he lived a wandering, unsettled life as a humanist student and poet. He then secured the patronage of Archbishop Albert of Brandenburg, Elector of Mainz. The following year he

devoted himself to satirising his cousin's murderer, Ulrich von Württemberg, and was made laureate of the Empire 1517. From 1519 he tried to recommend Luther's tenets to the Emperor Charles V., the aristocracy, and the hierarchy, and also inspired and joined in the efforts of Von Sickingen to gain ascendancy for the Ritterstand (the knightly order) by overthrowing the princes and nobles of the empire. His devotion to these two causes proved his ruin. On Von Sickingen's defeat and death (1523), Von Hutten fled to Basle and appealed to Erasmus for help. Erasmus refused to see him. Thence ensued a bitter and contemptible controversy, which lasted until, while under the protection of Zwinglius, Von Hutten died on an islet in the Lake of Zurich. He was immoral, vain, and restless, but withal chivalrous and patriotic. He wrote much in Latin and German, both prose and verse. He was no doubt a substantial contributor to the famous satire on the ignorance of the monks and friars, *Epistolæ Obscurorum Virorum* (1515–1517), provoked by the attack of the Cologne theologians on Reuchlin and his *Augenspiegel*. The writings issued under his own name, with all their faults, promoted enlightenment and the development of literary taste in Germany.

Hutton, DR. JAMES (1726–97), a distinguished geologist and natural philosopher, to whose epoch-making work, *Theory of the Earth* (1st. ed. 1785), the subsequent advance of geological science in Great Britain is largely due. Born and educated at Edinburgh, on leaving the university he entered a lawyer's office; but soon gave up law for medicine, which he studied in Edinburgh, Paris, and Leyden, where he graduated as doctor (1749). From 1750, when he inherited a farm in Berwickshire, to 1754 he studied agriculture in Norfolk and abroad. From 1754–68 he resided on and managed his farm. After this, having let his farm, he lived in Edinburgh, devoted to scientific researches and enjoying literary and scientific society. His theories and methods were brought into prominence and developed by Professor John Playfair.

Huxley, RIGHT HON. THOMAS HENRY, was born in 1825. He became a student at the Charing Cross Hospital, and, having qualified, entered the Navy as assistant surgeon in 1846. His first zoological work was done in the *Rattlesnake*, engaged in the survey of the Great Barrier Reef, and the result of his investigations were published, in the *Philosophical Transactions*, by the Linnæan Society, and in the Ray Society volume on the Oceanic Hydrozoa. In 1851 he was elected F.R.S., and three years later became Professor of Natural History at the Royal School of Mines, and curator of the Museum of Practical Geology, and held these offices till 1885, when he retired into private life. As a biological teacher, Professor Huxley has from the first been on the side of evolution. His scientific writings are very numerous; the most important of them are his *Anatomy of Vertebrated Animals* (1871), *Anatomy of Invertebrated Animals* (1877), the *Crayfish*, an *Introduction to the Study of Zoology* (1878), and in the front rank of the scientific work of the century

stand his Classification of Birds, and many of his papers in the *Journals* or *Transactions* of the various learned societies. Of a less technical character are *Man's Place in Nature* (1860-63), *Lay Sermons* (1870), *Critiques and Addresses* (1873), and *American Addresses* (1877). His little book on Hume is one of many proofs of his ability in philosophy proper. His *Essays on Controverted Subjects* (1892), with some others not collected, were originally addressed to magazine readers, and his destructive criticism of General Booth's "Darkest England" Scheme appeared in the *Times* (1890). Professor Huxley has been examiner in the London University, and was chosen chairman of the association for making it a professorial university in Dec., 1892; Fullerian Professor at the Royal Institution, Hunterian Professor at the College of Surgeons, President of the Royal, Geological, and Ethnological Societies, and of the British Association, Lord Rector of the University of Aberdeen, a Royal Commissioner on Sea-fisheries, and an Inspector of Salmon Fisheries (1881-85). He has received the Copley and Wollaston gold medals, and one from the Royal Society of New South Wales. Oxford, Cambridge, Edinburgh and Dublin, and several foreign universities have conferred honorary degrees on him, and he is a fellow or corresponding member of the principal learned societies at home and abroad. He was made a Privy Councillor in August, 1892.

Huygens, CHRISTIAN (1629-95), mathematician, mechanic, astronomer, and physicist, the Newton of Holland, was born at The Hague. His education was begun by his father Constantijn Huygens, the celebrated poet and diplomatist, continued at Leyden, under Vinnius and Schooten, and completed in the Juridical school at Breda. In 1649 he took part in the mission of Henry, Count of Nassau, to Denmark; but he soon gave up law and diplomacy for physical science, and gained distinction by attacking the unsound system of quadratures then in vogue. In 1654 he surpassed all approximations to the evaluation of the ratio of the circumference of a circle to its diameter. In co-operation with his brother, he made great improvement in the grinding and polishing of telescopes, and invented the achromatic eye-piece. The result was the discovery of one of Saturn's satellites (announced 1656), and of the ring (announced 1659). He invented the pendulum clock in 1656. From 1666 to 1681 he resided in France, where he produced his great work *Horologium Oscillatorium* (1673). On his second visit to England (1669) he was elected a fellow of the Royal Society, which still possesses three of his lenses of very long focal distance, which he made for aerial telescopes (1681-87). Among his achievements are the establishment of Hooke's wave theory of light, the resolution of the main undulation, and the explanation of the polarisation of light.

Huzuls, a rude Karpethian people in Galicia, said by Französ to be "a hybrid, uniting the Slavonic blood of the Ruthen [LITTLE RUSSIANS] with the Mongolic blood of the Uzen, his speech betraying

the former, while his name testifies to the latter" (quoted by Miss Muriel Dowie in *A Girl in the Karpethians*).

Hwen Thsang, also written HIOUEN (HUVEN) T'SANG (about 605-64), a Chinese Buddhist monk, and the most celebrated of those Buddhist pilgrims from China to India who have recorded their travels in quest of sacred objects and religious treatises. After travelling over China for several years as a teacher and a student of Buddhism, he settled at Chang-ngan (now Se-ngan-foo), where he became famous for his deep knowledge of sacred lore, and where he eventually died. In August, 629, he crossed the frontier, and plunged into the shifting sands of the Great Gobi desert. He crossed the Thien-shan mountains, over a glacier, and after much peril and suffering reached India, about which he travelled assiduously. He returned to China laden with precious books, etc., in 645, and was welcomed as a saint. His valuable itinerary was completed in 648. He translated into Chinese several Buddhist treatises brought from India.

Hyacinth (*Hyacinthus orientalis*), a liliaceous bulbous plant, native to Western Asia, and cultivated in Europe for more than three centuries, during which time countless beautiful varieties, the brightest ornaments of our borders in spring, have been evolved. The wild form has a loose raceme of only a few drooping flowers; but most sorts now cultivated have their flowers closely packed and horizontal. In colour they range from a deep, almost black, purple to a nearly true pale blue, to pink, deep red, yellow, and dead white, and they are rich in perfume. They can be grown either in soil, or in glasses nearly filled with water, if forced at first in the dark. The soil and climate of Holland is specially suited to them, and near Haarlem many acres are devoted to their propagation. Several species of the allied genus *Muscari* are also known as hyacinths, such as *M. botryoides*, the grape hyacinth, *M. racemosum*, the starch hyacinth, *M. comosum*, the tassel hyacinth, and the name "wild hyacinth" is often applied to the blue-bell, *Scilla nutans*. The flower known to the Greeks and Romans as *ιάκινθος* (*hyacinthus*) has never been properly identified.

2. A hard transparent mineral, usually of a yellow colour, found in Ceylon and consisting of the silicate of zirconium $ZrSiO_4$, being identical with the mineral known as zircon.

Hyacinthe, PÈRE, ecclesiastical title of CHARLES LOYSON (b. 1827), born at Lyons, entered the Carmelite order. He attracted attention by his preaching at Bordeaux, Perigueux, and (1865-1869) at Paris. The boldness of his views led to his being denounced at Rome for heresy, and in 1870 the Pope relieved him of his monastic vows. His eloquence gave a transient vitality to the latest phase of the Gallican movement in France, a phase which he originated in sympathy with the "Old Catholic" movement. He married an American lady in London in 1872, and, Dean Stanley being his friend, delivered four lectures in London, 1876. In 1893 he delivered a series of addresses in the provinces of France, and transferred

his church in Paris to a Dutch body of Dissident Catholics.

Hyæna, the sole genus of the family Hyænidæ, of the Æluroïd division of the Carnivora, from Asia and Africa. The name is also used for any individual of the genus. The dental formula is— $1\frac{3}{3}, C\frac{1}{1} PM\frac{4}{3} M\frac{1}{1} = 34$; the jaws are strong enough to crack the thigh-bone of a horse, and the tongue is rough as in the cats. There are four digits on each limb, with non-retractile claws, like those of the dogs, and the hinder ones are shorter than those in front, causing the body, which is covered with coarse, bristly hair, to slope towards the haunches. The tail is bushy, and there is a kind of reversed mane on the neck and withers. These animals are nocturnal, and very cowardly. They live principally on carrion, and so fulfil the useful office of scavengers, and dig up dead bodies from the grave. They often carry off sheep, and, it is said, occasionally children. The Spotted, or Laughing Hyæna (*H. crocuta*), about 2 ft. 6 in. at the shoulder, with yellowish-brown fur, marked with round black blotches, and the Woolly, or Brown, Hyæna (*H. fusca*), a little smaller, with reddish-grey fur, brindled with brown and black, inhabit the country south of the Sahara. The Striped Hyæna (*H. striata*) is a native of Northern Africa, ranging eastward to the Himalayas. It is about the same size as the Woolly Hyæna, and has yellowish-brown fur thickly striped with black.

Hyalea, one of the best-known genera of the shelled Pteropods (q.v.) or Thecosomata. Like the rest of the class, it is marine and pelagic. Some fossils referable to this genus have been found in the rocks of the Cainozoic period.

Hybridism, the crossing of distinct species of plants or animals, the term *mongrel* being used for the result of crossing two varieties of one species. The subject is of practical importance, especially in horticulture, as a means of introducing new forms; but of still more importance theoretically in relation to the theory of evolution. The principles of hybridism are much the same in the animal and the vegetable kingdoms.

There is no known authentic case of the fertile crossing of two species belonging to distinct families; but there are numerous cases, especially among plants, of such fertile crossing of species belonging to absolutely distinct genera. They are known as *bigeners* or *bigenetic hybrids*. Among orchids, for instance, it often happens that a plant belonging to genus *a* when pollinated by one belonging to genus *b* will produce seed; that not only will this seed grow, but that the plants thus produced may be pollinated by either of the parent forms, or even by some third species belonging to a third genus, *c*; and so on. Pollen from a plant of a distinct family, however, when placed on a stigma is as inoperative as so much mere dust.

It has been urged as an objection to the theory of evolution that distinct species are not, as a rule, capable of producing hybrids, and that such hybrids, when produced, are themselves sterile—the case of the mule, the domesticated hybrid of the horse and the ass, being a familiar instance in

point. It is argued that specific types have in this way been preserved immutable from the beginning. To this it may be replied:—(1) that, though the theory of evolution implies mutability of type, it does not suppose such mutability to have resulted from hybridism; (2) that the argument is mainly a circular fallacy, forms that are mutually sterile being, for that reason, ranked as distinct species, and then the conclusion drawn from them that species are mutually sterile; (3) that a distinction must be drawn between the sterility of the two species when crossed and that of their hybrid offspring, the two things by no means always varying together; and (4) that in this matter of sterility there is not the universal distinction, which is alleged, between the natural species of a genus in a wild state and the domesticated varieties of one species; but that the difference is only one of degree, cases occurring of every degree of fertility in the latter.

The facts of hybridism are often very remarkable. There is fairly conclusive evidence that our domestic races of dog have sprung from more than one wild species; but they are all now freely fertile among themselves. The hare and the rabbit have bred together, producing offspring extremely fertile with either parent form; but it is by no means a general rule that reciprocal crossings are equally fertile, *i.e.* that, if the male of species *A* produces fertile offspring with the female of species *B*, the male of *B* will do so with the female of *A*. Many closely-allied species cannot be crossed, or can only be so with difficulty, whilst others far more divergent in character may cross freely. Annual plants have been crossed by perennials, deciduous trees by evergreens, plants flowering at one season by those flowering at another, and natives of one country by those of another differing in climate. On the other hand, whilst several species of passion-flower (q.v.) can be readily crossed, they cannot be fertilised by pollen of their own species.

Darwin suggested, as an explanation of the admittedly frequent sterility of domesticated hybrids, the consideration that the reproductive system of an organism is the most delicately susceptible to slight changes in conditions such as domestication produces. It should, however, be borne in mind that in not a few cases domestication has induced, not sterility, but extreme fertility in hybrids.

Hydatid, the larval form of the tapeworm known as the *Tania echinococcus* (which frequently occurs in the alimentary canal of the dog). The adult worm is never found in the human subject, but the eggs when swallowed by man undergo development, and cysts may be formed in various organs, particularly the liver and lungs, and these cysts by a very gradual process of growth may attain a considerable size. In the cyst are found numerous *scolex* heads, each with its four suckers and bundle of hooklets, resembling the first joint of the adult worm. The treatment of hydatid tumour is a matter for the surgeon. The disease is common in Iceland, but infrequent in this country.

Hyde, a township and borough (since 1881) of Cheshire $7\frac{1}{2}$ miles E.S.E. of Manchester. The chief

industries are cotton manufacture and coal-mining. This flourishing borough includes the townships of Hyde, Godley, Newton, and Gee Cross. Population (1891) of borough 31,682, of township 20,354.

Hyderabad, or the NIZAM'S DOMINIONS, the largest native state, occupies the centre of the Deccan, lat. 15° to $21^{\circ} 30'$ N., long. 75° to $81^{\circ} 30'$ E., including the old provinces of Hyderabad and Beeder. It is for the most part a tableland 1,800 feet to 2,000 feet above the sea, with granitic ranges running N.W. to S.E. The chief rivers are the Godavery and Krishna. The climate is temperate, and much of the soil very rich and fertile, yielding grain, cotton, sugar-cane, and tobacco. The chief exports are steel, cotton, and teak.

HYDERABAD, the capital of Hyderabad state, stands at an elevation of 1,700 feet above the sea, on the right bank of the Musi, surrounded by a wall six miles in circumference. It is one of the chief seats of the Mohammedan religion in India. The British Residency stands on the left bank of the river. The principal buildings are the grand mosque, built in imitation of that at Mecca, and the Residency.

HYDERABAD, the historical capital of the British province of Scinde, stands about $3\frac{1}{4}$ miles from the east or left bank of the Indus, above the junction of the Fulailee branch. It is also the centre of postal, telegraph, and road communication for the district. The town occupies a steep height, and has a rampart of imposing appearance. The chief manufactures are silks, gold-work, pottery, and arms. The Scinde railway terminates at Kurrachee, on the other side of the river.

Hyder Ali (1728-82), son of a general of the Rajah of Mysore, who afterwards became tributary sovereign of Bangalore. He entered the Mysore army, and in 1749 became conspicuous for his bravery. He rose rapidly in rank and power until he deposed his master (1759), allowing him his title and a pension. The territory subject to Hyder Ali covered 80,000 square miles by 1767, when he made war on the British and dictated terms before Madras. In 1769 he made a treaty with them, but, resenting their refusal to support him after his defeat by the Mahrattas (1772) and relying on the aid of the French, he again took up arms in 1780. Sir Eyre Coote routed his army at Porto Novo (1781) and, following up this success, saved the Presidency. Hyder Ali was succeeded by his son Tippoo Saib.

Hydra. 1. A "water-snake," in Greek mythology a monster which dwelt near Lernæ in Argos. It had nine heads, and when it was attacked by Hercules two new ones grew in the place of each which he cut off, but he at last destroyed it by burning the heads instead of cutting them.

2. The common fresh-water Polype, the type of the family *Hydridæ* and order Hydroida. It is a small animal, living in ponds and ditches, attached by its base to the stems and leaves of water-plants. It consists of a small tube formed of two layers, an endoderm and ectoderm (q.v.), between which occurs the slightly-developed mesogloea

(q.v.): the tube is closed at the base. At the other end it is constructed to form the mouth, which opens on a raised area, or peristome, surrounded by a circle of hollow tentacles. The Hydra catches small organisms by its tentacles: the mouth opens into a cavity which is not separated from the general body cavity, the food is digested here and absorbed by the cells of the endoderm; there is no separate digestive cavity as in higher animals. It is hermaphrodite. It has long been believed that the Hydra has such a simple organisation that it can be turned inside out without injury, and its stomach will then act as the skin and *vice versa*; it was also believed that the animal could also be reproduced indefinitely by cutting it into pieces, each of which was asserted to grow into a fresh individual. Recent attempts to confirm these statements have been unsuccessful, though they have proved the Hydra to possess enormous powers of recovery from injury and reproductions of lost parts. Inversion was, however, always fatal, unless the animal could manage to wriggle back to its normal arrangement.

Hydragogue. [PURGATIVE.]

Hydrangea (*Hydrangea hortensis*), a popular conservatory and summer garden plant, introduced from China by Sir Joseph Banks in 1790. It is a low-growing shrub belonging to the saxifrage order, with opposite, rather large, oval, toothed, acute, light-green, deciduous leaves, and large globular clusters of pink flowers. The addition of alum or iron to the soil gives them a lead-blue tint. Almost all the flowers are neuter, having five large petaloid sepals and no petals, stamens, or carpels. The plant is propagated by cuttings.

Hydrastine, an alkaloid of composition $C_{21}H_{21}NO_6$ which occurs in the roots of the plant *Hydrastis canadensis*. It appears to be closely related to the alkaloid *narcotine*, and its properties and constitution have, with recent years, formed the subject of much chemical research and study.

Hydrates are compounds which are formed by the union of substances with water in definite molecular proportions. In some, these combining substances may unite chemically so that the water cannot again be easily eliminated; in others, however, the water appears to be more loosely combined than is usual in a true chemical compound, being driven away by application of moderate heat. Of this nature are many of the crystalline hydrates which many acids, salts, and organic compounds form with water, *e.g.* sulphuric acid, $SO_4H_2 \cdot 2OH_2$, copper sulphate, $CuSO_4 \cdot 7OH_2$, chloral, $CCl_3CHO + OH_2$. In hydrates of the first type definite compounds are often formed in which the hydrogen of the water is partially replaced by other elements or groups, *e.g.* $Ca(OH)_2$ ($CaO + OH_2$), *calcic hydrate*. It would be convenient to restrict to such compounds the term *hydroxides*, keeping hydrates for the other type of compound were it not that the distinction between the two classes is frequently impossible.

Hydra tuba, the name of the first stage after the egg in the development of some of the Hydrozoa

(q.v.) of the subclass *Acraspeda* (q.v.). It is a small fixed hydra-like body, but with solid tentacles. By a series of transverse constrictions it is divided into a series of segments, each of which ultimately develops a series of lobes and breaks away from the parent; they then swim about as independent jelly-fish. This method of development occurs in the commonest English jelly-fish, *Aurelia aurita*. It is found in the *Rhizostomeæ* and many of the *Pelagidæ*.

Hydraulic Cements. [CEMENTS.]

Hydraulic Engine is a motor driven by water under pressure. The pressure-energy of the fluid is converted therein into the kinetic energy of the moving parts of the engine. In the case of waterwheels and turbines the water that enters the engine is possessed of a definite velocity; and impact occurring, there is a direct transfer of kinetic energy to the moving parts. Such cases do not, therefore, come exactly under the above definition of hydraulic engines, though the term is frequently employed inclusively. The ordinary engine worked by water pressure is similar in many respects to the steam-engine. A piston fits closely in a cylinder of cast-iron or cast-steel, and is forced backwards and forwards by water that is passed into the cylinder on one side or the other alternately. Since water is but slightly compressible, its expansion during portion of the stroke is not available, and it is necessary, therefore, to pass full-pressure water into the cylinder throughout the stroke, all of which is relieved of pressure during the return-stroke, deprived of its pressure energy, and passed into the exhaust. This inability of the working fluid to expand constitutes the important difference between such an engine and the ordinary steam-engine. Two, or preferably three, cylinders are used to drive the same crank-shaft, for hydraulic engines are not adapted for great speeds, and it is necessary to carry any one piston past its dead-points by means of another. When three are used they may be arranged radially at 120° to each other, the three piston-rods pointing to the centre of the crank-shaft, and moving in the same vertical plane.

Hydraulic Friction means the friction of water against water as contrasted with the friction of solid against solid. There are important points of difference in the two cases. Hydraulic friction is independent of the pressure; there is no more waste of energy in a foot-length of a water-main at one level than there is in an equal length of the same main at a higher level, and, therefore, lower pressure. This constitutes an important reason why force-pumps with great lifts may be made more efficient than those with small lifts, the former not requiring a proportionate amount of power to overcome the fluid friction in the pump and pipes. On the other hand, hydraulic friction is proportional to the speed for slow rates of motion, increasing with more than proportionate rapidity as the rate increases. [FRICTION, HYDRAULICS.]

Hydraulic Limestone. [CEMENT-STONE.]

Hydraulic Press is a machine employed extensively for the compression of merchandise, various products in process of manufacture, and the like, for such purposes as the economy of space, the extraction of oil or other derivatives by the compression, or the improvement of the material under treatment. A thick cast-iron or steel hollow cylinder is fitted with a *ram* or cylindrical piece of metal that can slide freely into the hollow. When water is forced in under pressure, it presses on every portion of the ram that is open to the interior of the vessel, and the resultant force is one tending to drive the ram out. So that the ram shall be watertight, and yet move easily, Bramah introduced a collar of leather into a groove cut in the neck of the press. Water tending to pass outwards fills the collar and presses it against the ram, and so exit is prevented; the greater the water-pressure the more tightly will the collar cling to the ram. The characteristic property of a fluid—that it will transmit pressure equally in all directions—enables us to increase indefinitely the total available pressure of the ram, *e.g.* by doubling the sectional area of the ram the total liquid pressure thereon is doubled without increasing the pressure of the water, the larger dimensions of the press demanding, however, a greater quantity of pressure-water each stroke. [HYDRAULICS.]

Hydraulic Ram is an arrangement for raising water up to a high level by means of the fall of a larger quantity of water from a lower level. The mechanism, if self-acting, could not raise the whole of the available water to a greater height than that from which it is originally supplied, and thus only a certain fraction of the supply is elevated. Nevertheless, for small installations the mechanism is useful and fairly efficient, though for larger ones it is best to have a chain of converters consisting of main supply pipe, set of turbines, set of force pumps worked by the turbines, and delivery pipe to the higher level. [WATER SUPPLY.] The hydraulic ram has the main supply pipe leading to a low level. The flow of water through a special valve develops enough pressure to close the valve, and the momentum generated in the moving water causes it to force open another valve leading to an air-chamber. The momentum being neutralised, the second valve closes and the first opens. The air in the chamber is compressed by the inflow of water, and now that the valve is closed it reacts and forces the enclosed water up a delivery pipe to a higher level. The whole process repeats itself again, and so by an intermittent action a portion of the supply is elevated to a higher level than that from which it is derived.

Hydraulics is the general term for applied hydrodynamics. The chief applications of this science are either in the direction of water supply (q.v.) or of the utilisation or transformation of energy possessed by water under certain circumstances. In both these directions much has been done of late years, so much so that hydraulic engineering has separated itself from ordinary civil engineering, and now demands special training and experience. The question of the utilisation of

natural forces, as it is generally expressed, demands for its discussion an intimate knowledge of hydraulic principles; for the two best known instances are those of tides and of waterfalls, and in various parts of the world successful attempts have already been made to prevent entire waste of such energy. The practical machines dependent upon hydraulic principles are described separately. The chief of these are the *hydraulic press*, for producing a great intensity of pressure by means of a large bearing surface of water upon a ram enclosed in a suitable strong cylinder; the *water-wheel*, which is driven either by impact of running water or by the weight of water that is carried down in suitable buckets arranged round the circumference of the wheel; the *turbine*, which is the modern development of the water-wheel, and by stricter guidance of the descending water compels a greater percentage of its energy to be given to the wheel than before; the *pump*, *force-pump*, and *fire-engine*, for lifting water by a reciprocating motion of a piston in a cylinder; and the *centrifugal pump* for effecting the same result by a rotary motion of a water-wheel. Hydraulic presses are variously applied in the arts: for punching holes in metal plates, for riveting such plates together by squeezing wrought-iron rivets into shape after they have been dropped into the proper rivet holes, for working steel shears to cut metal, and the like. The well-known hydraulic lifts are precisely similar in principle, and are used extensively for domestic purposes, as well as for heavy work in engineering. Canal-locks are frequently worked now by hydraulic lifts; heavy guns are raised, lowered, or otherwise moved by the same means; and in large ship-building and repairing docks arrangements are made by which huge vessels are elevated on a series of powerful hydraulic lifts.

Hydrazines. Hydrazine (N_2H_4) is a remarkable compound, which has only been prepared within recent years by a complicated series of reactions. It is obtained united with water as the hydrate, $N_2H_4 \cdot OH_2$, a most reactive body, behaving as a strong base and neutralising acids to form salts, as *e.g.* $N_2H_4 \cdot H_2SO_4$. By replacement of the hydrogen by different groups of elements substituted hydrazines are obtained, many of which, *e.g.* *phenylhydrazine*, $C_6H_5N_2H_3$, are of exceedingly great importance, in chemical synthesis, and as reagents for the detection of certain classes of compounds.

Hydrides are compounds of hydrogen with some other element. In the case of the non-metals many hydrides of importance are known, but all are generally known by other names, as hydrochloric acid HCl , etc., so that the term *hydride* is chiefly restricted to the metallic compounds of hydrogen (copper hydride CuH_2 , sodium hydride Na_4H_2), of which many exist, but none of other than purely chemical interest.

Hydriodic Acid, a compound of composition HI . It may be formed by the direct union of its components in the presence of heated and finely-divided platinum. It is usually prepared, however,

by the joint action of phosphorus and iodine on water:



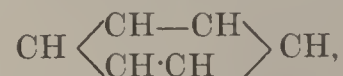
The pure substance is a colourless gas, with a suffocating smell, which can, by a pressure of 4 atmospheres at 0° , be converted to a liquid. It dissolves readily in water, forming an acid solution which, if exposed to air, slowly decomposes with formation of iodine. By replacement of the hydrogen of the acid salts the iodides (q.v.) are obtained.

Hydrobromic Acid (HBr) may be prepared by passing electric sparks through a mixture of bromine vapour and hydrogen. It is most readily obtained by the action of bromine upon phosphorus in presence of water:



It is a colourless gas, fuming strongly, and very irritating to the air passages and throat. It liquefies if cooled to -73° , and dissolves readily in water, forming an acid liquid which fumes in air, and possesses the irritating odour of the gas. The saturated solution contains 82 per cent. of HBr . The *bromides* are salts which are formed by the replacement of hydrogen by metals, and find many applications in medicine (bromide of potassium) and photography.

Hydrocarbons are, as their name indicates, compounds of the two elements carbon and hydrogen. These two elements may, however, be present in very diverse quantities, and to the extent of very many atoms in the molecule. Hence a large number of different hydrocarbons exist, the number being increased owing to the fact that compounds may have the same composition yet differ entirely owing to difference in the arrangements of the atoms in the molecule. They are divided into the *fatty* and *aromatic* hydrocarbons—the former being characterised by the arrangement of the carbon atoms in a straight chain, the latter by a ring constitution. Thus, as examples may be cited the two compounds *dipropargyl*, $CH \cdot C \cdot CH_2 \cdot CH_2 \cdot C \cdot CH$, and benzene



both of which have the formula C_6H_6 . They are also designated *saturated* or *unsaturated*, according to whether the number of hydrogen atoms in the molecule is as great as possible or not, this number in the fatty compounds being $2n + 2$, where n is the number of carbon atoms. They are formed in very diverse manners. Only one results from the direct union of carbon and hydrogen, viz. acetylene C_2H_2 . Large numbers occur in mineral oils as petroleum, while many are found among the distillation products of wood, coal, and other organic matters. A great many classes of synthetic reactions are also known by means of which the synthesis of hydrocarbons from less complex compounds can be effected. Amongst important or well-known examples of hydrocarbons may be cited *paraffin* and other waxes, *naphtha*, *petroleum*, *ozokerite*, *vaseline*, *benzene*, *naphthalene*, *marsh gas*, all of which may be referred to.

Hydrocephalus, an accumulation of fluid within the cavity of the skull, either in the ventricles of the brain or in what is known as the subarachnoid space. Acute hydrocephalus is caused by inflammation of the membranes which enclose the brain. [MENINGITIS.] Chronic hydrocephalus is usually a disease of intra-uterine life or of early childhood, and as it thus develops before the vault of the skull has become completely ossified, the accumulating fluid distends the yielding cranial bones and produces great deformity; the forehead protrudes, the eyes are pushed forwards, and the enlargement of the skull is in marked contrast to the emaciated face and puny frame of the affected subject. The mental condition of the child suffers, as might be expected, from the damage which results to the central nervous system, convulsions are not infrequent, and the child rarely lives more than two or three years. In some instances, however, the disease becomes arrested, and the patient may live to adult age. Little can be done in the way of treatment beyond the adoption of palliative measures, and the promotion of the general nutrition.

Hydrochloric Acid, also known as MURIATIC ACID and SPIRITS OF SALT, is a compound of the formula HCl , *i.e.* is composed of one part of hydrogen united with 35.5 parts of chlorine. It is a gas with a very pungent odour, which can be condensed by cold and pressure. It has been known since the 15th century. The ordinary acid of commerce is, however, not the pure acid but its solution in water, in which it is very soluble, 1 volume of water absorbing over 500 volumes of the gas at 0° . The solution fumes in the air, and has a specific gravity of 1.22 if concentrated, but becomes weaker on boiling until a 20 per cent. solution is obtained, which then boils unchanged. Commercial acid is frequently of a yellow colour, due to the presence of impurities, usually iron. The gas may be obtained by the direct union of hydrogen and chlorine on exposure to sunlight, but is always prepared and manufactured by the action of sulphuric acid upon common salt, and hence results as a bye product in the manufacture of soda. [LEBLANC PROCESS.] The following equation represents the change:



The salts obtained by replacing the hydrogen by a metal are termed *chlorides* (q.v.), and many are of great importance from chemical, domestic, and industrial points of view, while the acid itself is also much used in manufacturing and purely chemical operations.

Hydrocinnamic Acid, a compound of the formula $\text{C}_6\text{H}_5\cdot\text{CH}_2\cdot\text{CH}_2\cdot\text{CO}_2\text{H}$, being β *phenyl propionic acid*. It forms needle-like crystals, melting at 47° and soluble in hot water and alcohol. It may be prepared by many synthetic reactions, and is a product of the decay of nitrogenous matter such as brain, albumen, etc.

Hydrocœle, the occurrence of fluid effusion in the serous sac which envelopes the testis.

Treatment usually consists in tapping the sac and evacuating the contained fluid.

Hydrocorallina, a group of Hydroids (q.v.) including those in which the skeleton is massive and calcareous, and which have generally been included among the Anthozoa. They are divided into two groups, the Millepores, and the Stylasters. The former form massive or lobed or flat expanded skeletons, through which run a double series of tubes; one set is large, and one small. The large tubes are intercepted by horizontal plates or tabulæ. These tubes are occupied by large "gastrozooids" or digestive polypites, while the smaller ones which surround them are occupied by "dactylozooids." These have no mouth, and simply serve to capture food, which is digested by the gastrozooids, which supply it to the colony by means of a series of canals. The dactylozooids may be irregularly scattered or placed in definite circles around the gastrozooids. The Stylasters form branching plant-like colonies, on the surfaces of which open a number of apertures on raised areas. The pores are broken up by septa, which radiate from the walls towards the centre. These, however, are not true septa. In addition to the large gastrozooids, there are numerous smaller ones (dactylozooids) arranged around each of the former, the whole group forming a cyclo-system. The reproductive organs are external, and are developed in sac-like "ampullæ." This also affords clear evidence of the Hydrozoan affinities of these corals. The Millepores are generally colourless or pale yellow, but the Stylasters are a fine red tint.

Hydrocyanic Acid. [PRUSSIC ACID.]

Hydrodynamics, the science of the force-relations of water and other liquids. Usually it is restricted to such relations that produce motion of the fluid. When equilibrium is the result the division of Hydrostatics (q.v.) is entered. The theoretical study of hydrodynamics is not simple, but a knowledge of a few leading principles is often enough to solve many problems of practical importance. The most important principle is that of *continuity*. If in a mass of liquid any imaginary volume be taken, the amount of liquid that flows into this volume during any time must be equal to the amount that flows out; for liquids are practically incompressible, and as much remains in the enclosure at the end of the interval as existed therein at the beginning. The same principle is extended to all fluids, including both gases and liquids, but here it must be modified if the density of the enclosed fluid has altered during the interval. This principle helps us at once to determine the speed of a stream across a given section when its speed at another given section is known. The great theorem connecting the varying pressure, speed, and level of a given quantity of water in a stream-line is due to Bernoulli, and has far-reaching applications in the design of turbines, centrifugal pumps, and other machines. It states that any such small quantity of water at any instant during its flow possesses a definite pressure p , density ρ , height h (reckoned from the free surface level), and

speed v . These will vary in such a way that the sum of the terms

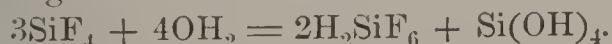
$$\frac{p}{\rho} + gh + \frac{1}{2}v^2$$

will always remain constant, g representing the intensity of gravity. The first term is sometimes called the pressure-energy term, the second is a measure of the potential energy, and the third of the kinetic energy of the quantity of water taken. One deduction from this theorem is that the speed of flow from a small orifice in the side of a vessel containing liquid is the same as if the liquid fell from the free surface level down to the orifice. If h is the vertical distance between these two levels, the speed v would be $\sqrt{2gh}$, g being, as before, the intensity of gravity. This is known as *Torricelli's Theorem*.

Hydro-Electric Machine is a machine invented by Sir William Armstrong for the separation of opposite electricities on a large scale. Steam is generated in a boiler, and is made to blow through specially-shaped orifices of wood against a series of points arranged in front. In this simple way, analogous to the rubbing of dissimilar substances (such as glass and silk), the separation is effected, and very great differences of potential produced on the collectors. [ELECTRICITY.]

Hydrofluoric Acid (HF). Pure hydrofluoric acid is a colourless liquid, which is obtained by heating the acid fluoride of potassium HKF_2 . The preparation must be performed in a platinum retort owing to the highly corrosive action of the acid, and is attended with considerable danger, as the fumes of the acid attack the throat, and at least one death has occurred through the inhalation of the vapour. It boils at 19.4 , and has a specific gravity of about $.99$. A dilute acid is obtained readily by the action of sulphuric acid upon fluorspar CaF_2 , in lead or platinum vessels. This aqueous acid attacks metals, forming salts known as fluorides (q.v.); gold, lead, platinum, however, resist its action. It may therefore be kept in vessels of these substances, but caoutchouc bottles are more convenient for this purpose. It attacks glass, forming a fluoride of silicon (SiF_4) and water, and is hence used for etching glass, etc.; it cannot for this reason be kept in ordinary bottles. All operations involving the use even of the aqueous acid should be conducted with great care, as it evolves poisonous vapour, and produces very painful blisters on the skin. [FLUORINE.]

Hydrofluosilicic Acid, an acid of composition H_2SiF_6 which is obtained in aqueous solution by passing the fluoride of silicon into water:



It thus forms a colourless, fuming acid liquid, which finds its chief use in *qualitative analysis*, being used as for the separation of barium from strontium salt, and as a reagent for potassium salts.

Hydrogen (H = 1). Although hydrogen was known in the 16th century, being first described by the chemist Paracelsus, its nature as an elementary substance was not demonstrated until the researches

of Cavendish in 1766. The same chemist also showed that water is produced when the inflammable air, as he termed hydrogen, burns either in air or in oxygen. It occurs in the free state to only a small extent upon the earth, being found in volcanic emanations, in the gases from oil-wells, and as a product of the decay of animal matter. In combination, however, it is found to a very large extent, forming one-ninth the weight of water, and being a constituent of most organic substances and of all acids. The sun is completely surrounded by an atmosphere of hydrogen, the presence of which has also been demonstrated in many stars. It may be prepared by the decomposition of water by means of an electric current. It is most conveniently obtained by the action of certain metals upon acids, zinc and sulphuric acid being suitable:



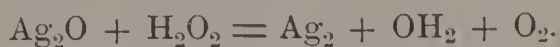
numerous other methods also can be employed. It is a colourless gas, possessing neither taste nor odour, and is the lightest body known, its density being about $.07$ that of air. It is only slightly soluble in water, 100 volumes of this liquid absorbing about two volumes of the gas. It is the most difficult of all gases to liquefy, and it is doubtful if its liquefaction has ever been really effected. Certain metals possess the power of condensing hydrogen within their substance—*occluded hydrogen*—the gas being again evolved on heating. Palladium absorbs in this manner 900 times its volume of hydrogen; the resulting alloy was called *hydrogenium* by Graham. Iron also can similarly absorb the gas, which is hence frequently found in meteoric iron. With the halogens (q.v.) it forms acids uniting directly with *fluorine* even in the dark, and with chlorine if exposed to sunlight. In many of its characteristics it shows resemblances to the metals. It has the least atomic weight of all the elements, and on that account forms the unit in terms of which the atomic weights are expressed. In air hydrogen burns with a pale blue flame, and mixed with oxygen it forms a mixture which explodes violently on application of a light. A mixed jet of hydrogen and oxygen burns with very intense heat, and is used for the production of high temperatures, and largely for limelight, these forming the chief applications of hydrogen for technical purposes. It is, however, sometimes employed for filling balloons, and in the chemical laboratory finds frequent usage as a reducing agent.

Hydrogen Peroxide, a compound represented by the formula H_2O_2 , consisting therefore of the same elements as water, but with double the amount of oxygen in the molecule. It may be prepared by adding barium peroxide in small quantities to dilute hydrochloric acid:



The solution thus obtained is concentrated as far as possible under the air-pump, until a syrupy colourless liquid results (specific gravity 1.45). The solution, however, readily loses oxygen, but is more stable if dilute. It acts as a strong oxidiser, converting many elements (such as chromium) into

their oxides, the peroxide itself being reduced to water. Some metals (as silver), however, when finely divided act on the liquid, and liberate oxygen without undergoing any change themselves [CATALYSIS], and in some reactions it reduces oxides thus :



It finds many technical applications ; thus, owing to its power of converting black sulphide of lead into white sulphate, it is used for renovating pictures in which the pigment white lead has become blackened. A solution is also employed as a hair-wash to give a golden shade, and for the purpose of bleaching when other substances might be injurious, *e.g.* with feathers, ivory, etc. It has been used in medicine as a disinfectant, and as an antiseptic or "germicide." In the laboratory it is largely used in various analytical processes.

Hydroida, an order of Craspedote Hydrozoa (q.v.), including those in which the body is small, is usually fixed by an adherent base, and has a ring of tentacles around the mouth : they are rarely simple (*e.g.* *Hydra*) but are usually colonial. They are nearly all marine, but *Hydra* is fresh-water, and *Cordylophora* (q.v.) has acclimatised itself to fresh or but slightly brackish water during the present century. The order is divided into three sub-orders: (1) the Eleutheroblastica, including the fresh-water *Hydra* and one or two doubtful genera ; (2) the Gymnoblastica, in which the general colony (hydrosoma) is protected by a chitinous skeleton or "polypary," which does not, however, protect the polypites or individuals (*Cordylophora* (q.v.) is a very good type of this group) ; (3) Calyptoblastica or Thecaphora, in which the polypites are protected by expansions of the skeleton into hydrothecæ or cups ; these may be "sessile," being attached to the main tube as in *Sertularia*, or pedunculate, being borne on long stalks as in *Campanularia* ; (4) Hydrocorallinæ (q.v.), including those which form a massive calcareous skeleton.

Hydrometer is an instrument for the determination of the density of a substance. Most hydrometers are for the determination of liquid densities, and many of them have special names. Thus a *lactometer* is a hydrometer to test milk by observation of its density, a *salinometer* is for salt water, a *saccharometer* for solutions of sugar, and an *oleometer* for oils. The ordinary hydrometer is very simple. It consists of a glass float with a thin graduated stem. It floats with the stem vertical by reason of a small enclosed quantity of mercury at the lower end. In light liquids the greater portion of the stem is immersed, but in heavier liquids the instrument rises, and less of the stem is immersed. By proper graduations on the stem, the liquid level may give direct readings of the density of the liquid in which the instrument is made to float. Nicholson's hydrometer or *areometer* is on the same principle, but is arranged for the determination of the densities of solids. The instrument is usually of metal ; it is much larger, and only one mark is necessary on the stem. There is a cup

supported at the top, and another at the bottom of the instrument, for the estimation of the weight of the solid in air and in water respectively. These two weights are sufficient to determine the density required. [HYDROSTATICS.]

Hydromys, a genus of water-mice, with five species, the type of a sub-family (*Hydromyinae*) from the Australian region. The molars are only two on each side in each jaw. They live near water, and the hind-feet are partially webbed.

Hydrophilous, a term, rarely required in vegetable physiology, used with reference to the few cases, such as that of *Vallisneria* (q.v.), in which cross-pollination is effected by the agency of water.

Hydrophis. [SEA-SNAKE.]

Hydrophobia (RABIES), a disease of the canine tribe which sometimes affects man. When it occurs in the human subject it is usually the result of the bite of a rabid dog ; symptoms do not, as a rule, appear until the lapse of several weeks (sometimes months), after the injury. There is usually some pain at the site of the wound, the patient becomes feverish, and after a while the characteristic symptom, disinclination to swallow fluids, becomes developed ; the patient becomes excited, his condition resembling that of acute mania ; the throat is inflamed, and repeated attempts to expectorate the viscid saliva which exudes into the mouth are made. Any attempt to swallow produces a spasm of the muscles concerned in that action, or even general convulsions, the pulse becomes quick, the patient feebler, and the disease terminates in death in two or three days. M. Pasteur has succeeded in protecting animals from rabies by preventive inoculation. By injecting the virus into rabbits, then subsequently removing their spinal cords and drying these, he has succeeded in obtaining a mitigated poison ; the longer the spinal cord is dried, the less virulent it becomes. Such weakened material is found to possess the power of protecting an animal against the effects of inoculation with the more virulent poison. Pasteur has achieved considerable success in applying this method to the treatment of persons who have been bitten by rabid dogs.

Hydroquinone possesses the formula $\text{C}_6\text{H}_4(\text{OH})_2$, being what is chemically known as *para-dihydroxyl benzene*. It is best obtained by reducing *quinone* (q.v.) by sulphurous acid. It forms monoclinic or hexagonal crystals, which melt at 169° , and is readily soluble in water, the solution being coloured brown by ammonia. Of late years hydroquinone has grown in importance owing to its introduction by Captain Abney as a photographic developer. [PHOTOGRAPHY.] For this purpose it possesses the advantage of cleanliness, keeping clear and colourless during development, while the image formed by the silver deposit is of an exceedingly good colour. It is generally used in a solution of 1 or 2 grains to the ounce, with the addition of a dilute solution of ammonia, sodium hydrate or sodium carbonate : different formulæ being recommended by the different plate-makers.

Hydrostatic Bellows, an arrangement on the same principle as the hydraulic press, by which a heavy weight distributed over a large area may be lifted by the pressure of water produced in a small vertical pipe. The weight is supported on a large board that forms the cover of an ordinary bellows. As water is poured down the small pipe the bellows gradually dilate and the weight is lifted.

Hydrostatic Paradox, the old name given to the multiplication of force by transmission through liquid. The intensity is unaltered, but if the bearing surface is increased the total value of the force on that surface is proportionately increased. If motion is produced by the action of the greater force, there will be no multiplication of the available energy by transmission through the liquid; what is gained in force is lost in distance traversed, as in the analogous case of the simple lever.

Hydrostatics, the science of the force-relations of liquids in equilibrium. A liquid has no rigidity—that is to say, it may change its *shape* under the action of extremely small forces. This absence of rigidity may be difficult to observe in some cases, owing to the *viscosity* of the liquids taken. Nevertheless, with all liquids small forces can produce indefinite distortion, although in the case of viscous liquids much time may be required for the effect to be rendered visible. Water, ether, and alcohol are examples of mobile liquids; pitch and sealing-wax are examples of very viscous liquids. A stick of sealing-wax supported horizontally at its extremities will in the course of weeks become so curved that it falls from its supports. A tallow candle if similarly supported will at once manifest a certain amount of curvature, but will not become further bent. The sealing-wax is called a hard liquid; the candle is a soft solid. The resistance of a liquid to diminution of bulk is very great, like that of a solid. The compressibility of water, for example, is so slight that for a long time water was thought incompressible. [CAVENDISH EXPERIMENT.] This characteristic distinguishes liquids from gases, which possess great elasticity (*i.e.* they change their *volume* readily under the action of very small forces) as well as no rigidity. If a mass of liquid be at rest its pressure at any point on any surface must be at right angles to that surface, otherwise the oblique pressure of a non-rigid substance would produce motion. Hence it may be shown that at any point the pressure is the same in all directions, and an ordinary definition of a liquid at once follows, which assigns to such a substance that characteristic property. If therefore a pressure of a definite intensity per square inch be imposed at one spot on an enclosed volume of liquid, that pressure will be transmitted in all directions through the liquid, and every portion of its boundary will feel the same intensity of pressure. This is the principle of the hydraulic press, and the explanation of the hydrostatic paradox (q.v.).

When a solid body is entirely immersed in water (this liquid is taken as an example) every portion of its surface is acted upon by a normal pressure.

An infinite number of forces thus exist, and we know that their resultant is an upward force equal to the weight of the water displaced, for before the body was introduced the water subsequently displaced was just supported by the same set of forces. Hence the foreign substance is acted upon downwards by its own weight and upwards by the weight of water displaced. If it has the same density (q.v.) as water these two forces balance, and the body remains in position without the application of other forces. If its own weight preponderates its density is said to be greater than unity, and it shows a tendency to sink. If the water displaced has the greater weight its density is less than unity, and it tends to rise to the surface. If this tendency is permitted it will assume a floating position such that the weight of the water displaced in that position is now equal to the weight of the substance itself.

Further, it then assumes a position such that its centre of gravity and that of the water displaced are in the same vertical line, otherwise from statical considerations there could be no equilibrium. The density of a substance, or relative mass of the substance compared with an equal volume of water, is calculable when we know its weight in air and in water. The difference between its weight in air and in a vacuum is generally neglected. It is then only necessary to divide the weight in air by the loss of weight in water. If it float in water, the weight of water displaced by the whole volume is determined by attaching a heavy substance to it, such that the combination will sink. The whole is then estimated as one body and a deduction made for the heavy substance.

The free surface level of a liquid at rest must be horizontal. For a spherical particle at the surface is acted upon by its own weight and by a hemisphere of fluid. The former is a vertical force, and the resultant of the latter must therefore also be vertical. This could not be unless the surface were at right angles to the vertical.

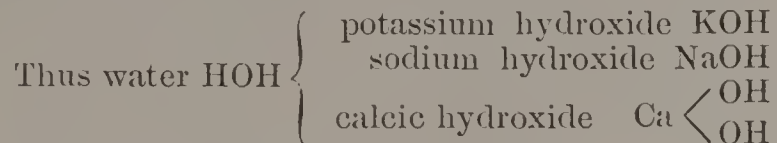
The pressure at any depth in a liquid is that due to the vertical height of liquid above. It may be that the base of the vessel is greater or less in area than the surface of the liquid; the total pressure on the base will be independent of such variety if the depth of liquid remains constant. Thus clear distinction must be made between the weight of the liquid and the total pressure of liquid on the base of the vessel.

Hydrothorax, an accumulation of fluid in the pleural cavity.

Hydrotropism, curvature expressing unequal growth (heterauxesis) induced by the proximity of moisture. *Positive hydrotropism* is curvature towards the moisture; *negative hydrotropism*, curvature away from it. If, for example, the roots from germinating seeds grow [under the influence of geotropism (q.v.)] through holes in the bottom of a box soaked with moisture, they will bend backward, especially if the air be dry, towards the moist wood. This is *positive*. The rarer negative curvature is exhibited by the sporangiferous hyphae of the

fungus *Phycomyces*. The term hydrotropism was originally suggested by Darwin.

Hydroxides are compounds which may be regarded as derived from water by the partial replacement of its hydrogen, but the replacement may extend over several molecules. This is seen by the inspection of the formulæ of these compounds ;



The metallic hydroxides mostly exhibit basic properties, those of sodium and the allied metals being strongly alkaline. [HYDRATES.]

Hydroxyl is the name given to the group of elements OH which exists combined in hydroxides, alcohols, and many other classes of compounds.

Hydroxylamine, or OXYAMMONIA, a compound of composition $\text{NH}_2\cdot\text{OH}$ usually prepared by action of hydrogen upon a nitrite or nitrate, the hydrogen being generated in the vessel containing the compound. Its solution is a strongly basic substance, which combines with acids to form salts. It possesses strong reducing properties, and has been used as a photographic developer. The pure substance has been prepared only within very recent years, and is a strongly reactive and readily explosive crystalline solid.

Hydrozoa, one of the two classes of the Phylum Cœlenterata (q.v.). It is separated from the Anthozoa (q.v.) by the fact that the digestive cavity is not separate from the general body cavity, into which the mouth at once opens. The generative products, moreover, are usually discharged to the exterior and not into the body cavity and thus out by the mouth or special pore. Very commonly they are dimorphic, or possess two distinct forms; thus the common hydroid colony *Millepora* has two quite dissimilar sets of zooids; this is still better shown in the Siphonophora (q.v.), in which the individual polypites are modified to serve very different functions; thus some are reproductive, others nutritive, others protective, and others locomotory. Alternation of generations (q.v.) is also common; a fixed colony often gives rise to free-swimming jelly-fish in which the reproductive organs are developed. The gastric cavity or stomach is simple in structure, but a series of four ridges may run along it, and thus increase the digestive surface. The Hydra is the simplest type of the Hydrozoa, but this is probably the result of degeneration rather than of having retained the primitive characters of the order. The Hydrozoa mostly have a soft chitinous skeleton, as e.g. in *Sertularia* (the Sea-fir), but it may be massive and calcareous as in the *Millepora*. The group is divided into two subclasses:—

- I. CRASPEDOTA. Order 1. Trachymedusæ (q.v.).
2. Hydroida (q.v.).
3. Siphonophora (q.v.).

- II. ACRASPEDA. 1. Tetrameralia.
2. Octomeralia.

Hyères, a town and commune of France, in the department of Var and the arrondissement of

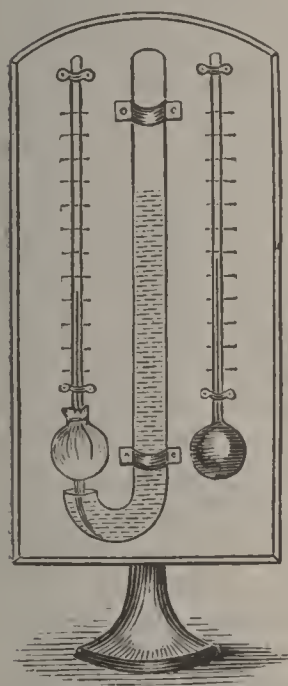
Toulon. The town is 3 miles from the coast of the Mediterranean, lat. $43^{\circ} 7' \text{ N.}$, and long. $6^{\circ} 7' \text{ E.}$, on the S.E. slope of a hill. The neighbouring market-gardens are famous for early fruit and vegetables and for winter roses. Orange-flower water is the chief product of the town.

Hygiene. The study of the means of preventing disease and prolonging life is one which dates from very early times. The extent to which inquiry had been pushed at a very early period in this matter is seen on a study of the Book of Leviticus, and, with regard to the Greeks, evidence of a like kind is to hand in the writings of Hippocrates. During the Middle Ages but scant attention was paid to the subject of preventive medicine, and the formidable epidemics which raged in Europe until as late as the seventeenth century, were no doubt attributable in the main to the neglect of this study. Attention came at length to be directed to the evils attendant upon overcrowding, want of cleanliness, and the like, and the great discovery of vaccination at the end of last century opened up the prospect of further development in disease prevention. In the present century considerable progress has been made. The Vaccination Acts have been the means of affording to large masses of the population protection from a most formidable disease; the Factory Acts have done much to ameliorate the condition of workers; and the various Public Health Acts have caused the undertaking of schemes for the supply of pure water, for the disposal of excreta, and have resulted in the abatement of many nuisances. With the growth of the system of registration of deaths, light has been thrown upon the distribution of disease, and the later development of the practice of notifying infectious disease will, no doubt, be productive of increased knowledge and improved means of combating the progress of epidemics. The recognition of the evil effects of breathing a confined and vitiated atmosphere, the demonstration of the relationship of such disease as consumption to dampness of soil, the spread of cholera and typhoid by contaminated water supplies, the connection between food and epidemics (as, for instance, in scarlatina and diphtheria epidemics traceable to milk supplies), and the relation between the diseases of animals and of man—on these and on other matters the study of hygiene has, during the last fifty years, thrown much light. The study has already resulted in a material reduction in the death-rate.

Hygrometer, an instrument intended for the measurement of the amount of moisture in the air. [HYGROMETRY.]

Hygrometry is that branch of physics which deals with the moisture contained in the atmosphere. It involves a knowledge of the principles of heat, and is generally studied with the questions of evaporation and condensation. The greatest amount of water vapour that can be contained in a cubic foot of air will depend upon the temperature. For every temperature there is a definite maximum pressure producible by the water-vapour, this pressure increasing with the temperature. Thus,

as the air gets hotter, it becomes able to contain further quantities of vapour without deposition. It is not usual for the air to contain as much vapour as it can hold under its given conditions of temperature. The fraction of this maximum that is actually present is called the *relative humidity*. This evidently increases as the temperature falls, without change of the absolute quantity of vapour per cubic foot, until a temperature is reached when the air cannot become cooler without condensation of vapour taking place. At this critical temperature, called the *dew-point*, the air is saturated with water-vapour, and its relative humidity is unity. [DEW.] The dew-point cannot be higher than the actual temperature of the air without danger of condensation occurring with great



THE WET AND DRY BULB
HYGROMETER.

violence. Such a state of things is rare ; it is only possible when the atmosphere is very pure and free from dust or other nuclei that act as centres of formation of water-drops. Instruments for determining the dew-point are simple in construction. They are arranged to cool down the air by application of cold water or by evaporation of some such volatile liquid as ether. In this way the air is brought to a temperature below the dew-point, and deposition of dew results. With a sensitive thermometer the exact temperature of deposition is obtained. Hygrometers working in the above way are direct-reading. The best are due to Regnault and to Dines. A pair of thermometers, the bulb of one of

which is kept continually moist by being surrounded with a moist wick, constitute the Wet and Dry Bulb Hygrometer. The wet bulb thermometer records a lower temperature than the other, unless the air is saturated, on account of continual evaporation from its surface. From the two observed temperatures the dew-point may be calculated. Hygroscopes merely exhibit the presence of moisture in the air. They generally consist of some substance capable of readily absorbing moisture whose elastic properties are modified thereby and rendered easily visible. The type is illustrated by Saussure's hair hygrometer, in which a length of hair varies with the degree of moisture of the surrounding air.

Hymen, or HYMENÆUS, in classical mythology the god of marriage, a personification of the bridal song. The various legends agree that he was a beautiful youth. In art his attribute is a (nuptial) torch.

Hymenocaris, an extinct genus of Phyllopora (q.v.) found in the Skiddaw slates and other rocks of the Ordovician period. It is of interest as the earliest known genus of the Phyllopora.

Hymenomycetes, an order of fungi (q.v.)

belonging to the sub-class Basidiomycetes (q.v.), and including the mushroom (q.v.) and most of the other plants to which the name fungi is popularly applied. They have generally a loosely-branched filamentous *mycelium* or "spawn," in the soil or other nidus on which they may grow, such as the stem of a tree, but the mycelium may be compacted into a *sclerotium* or into elongated strap-like strands, known in *Agaricus melleus* as *rhizomorphs*, which ramify under the bark of pine-trees. From the mycelium rises the *compound sporophore* or *hymenophore*, which is generally a *pileus* or umbrella-like body on a stalk or *stipes*. In some, the entire sporophore is at first enclosed in a membrane, the *velva* or *velum universale*; in others, a membrane, the *velum parziale*, encloses the lower surface of the pileus, and on bursting is represented by a torn ring or *annulus* round the stipes. In *Amanita* (q.v.) both membranes are present. Through the sporophores of some forms, especially of *Lactarius*, hyphæ secreting an abundant milky, but generally acrid, juice extend. The *hymenium*, or spore-bearing surface, is generally on the under side of the pileus. It is variously disposed, being smooth in the *Auricularini*, on radiating *lamellæ* or "gills" in the *Agarics* (q.v.), lining tubes or "pores" in the *Polyporei*, and covering dependent spine-like bodies in *Hydnei*. It is made up of rows of club-shaped cells, some of which, known as *paraphyses*, are barren, others, known as *cystidia* (though also barren), of relatively greater size, and others, the *basidia*, ending in the points known as *sterigmata*, mostly four on each basidium, from which the spores, hence called *sterigmatospores* or *basidiospores*, are formed and abstricted. The Hymenomycetes thus differ from the Gasteromycetes (q.v.) in having the hymenium exposed to the air (*angiocarpous*) before the spores are ripe. There are no known sexual organs in these plants. The order is represented in all quarters of the globe, and comprises nearly all the fungi which are of value as food. It is not represented in a fossil state, except in Pleistocene peat.

Hymenoptera (membranous-winged), an order of insects including the ants, bees, wasps, saw-flies, gall-flies, ichneumon flies, etc. (q.v.). The main character of the order is the possession of an ovipositor on the end of the abdomen of the female. It is developed either as a saw (*serra*), a sting (*aculeus*), or a boring organ (*terebra*). By means of this the eggs are deposited in a suitable place for development as in the leaves of plants (gall-flies), or in other insects (ichneumon flies). In some, e.g. the wasps, it is a defensive organ.

Hymn, in Greek literature a song in praise of gods or heroes, sometimes, like the Homeric hymns, in epic metre, but more usually in lyric. A Christian hymn is defined by St. Augustine as "praise to God with song." At a later date hymns varied considerably in purpose and character, and the word acquired a more extended meaning, so as to include a prayer or any expression of devotional feeling in a metrical or rhythmical form.

The hymnody of the early Church was based on that of the Jews. The practice of singing hymns is first mentioned in the Gospels. There is nothing to show whether these hymns were or were not the Psalms of David. On the other hand the canticles, *Magnificat*, *Benedictus*, etc., are closely modelled on the sacred poetry of the Hebrews. Many of the hymns and poems of the early Greek Church—e.g. those of Gregory Nazianzen (330–89)—are in classical metres. But at the same time the use of the Jewish Psalter and of the “Hallelujah” and “Hosanna,” as well as the character of the versicles and antiphons, shows that Christian worship was influenced by Jewish traditions. The *Gloria in Excelsis*, *Gloria Patri*, *Te Deum*, and other doxologies composed during this period are rhythmical but non-metrical hymns based on passages of Scripture. There seems to have been a prejudice against the use of hymns in the services of the Church, which lasted till the fifth century or later, but it was afterwards found that they could be made a vehicle for impressing orthodox dogmas on the minds of the people, and thus preventing the progress of heresy. After the final separation of the Eastern and Western Churches the number of hymns in the former greatly increased. Amongst the writers of Greek hymns may be mentioned St. Andrew, Archbishop of Crete (660–c. 732), whose “Christian, dost thou see them?” was, like many other early hymns, translated by Dr. J. M. Neale, and Joseph the Hymnographer (d. 883). The earliest Latin hymnographers were St. Hilary of Poitiers (d. 368) and St. Ambrose of Milan (c. 340–397). Of the many hymns attributed to the latter about a dozen are considered genuine. Perhaps the most famous name in the following centuries is that of Gregory the Great (540–604). The processional hymn, *Gloria, Laus, et Honor* (“All glory, laud, and honour”), sung on Palm Sunday, was written by St. Theodulph of Orleans (d. 821). *Veni Creator Spiritus* (“Come, Holy Ghost, our souls inspire”) is attributed to Rabanus Maurus, poet to Charlemagne. A great impulse was given to hymn-writing by Notker (c. 840–912), a Benedictine monk of St. Gall, who introduced the sequence or prose, a rhythmical but non-metrical composition, between the reading of the Epistle and Gospel. Sequences afterwards assumed a metrical form, and thus became identical with hymns in the narrower sense. The greatest writer of mediæval hymns and sequences was Adam de St. Victor (d. circa 1180), who founded the Victorine school. But no individual hymns are more celebrated than the *Dies Iræ* (“Day of wrath, O day of mourning”) by Thomas of Celano, the friend of St. Francis of Assisi, and the *Stabat Mater* of Jacobus de Benedictis (or Jacopone da Todi) (d. 1306).

Soon after the Reformation the liturgical use of hymns was discontinued in the English Church. Seven hymns translated from the Latin, one for each of the hours of prayer, were given a place in King Henry's Primer (1545), but they did not reappear in that of King Edward. Their place was taken by Sternhold and Hopkins' metrical version of the Psalms (1561), which in 1696 gave way to

that of Tate and Brady. Many hymns were, indeed, written during the Elizabethan period, and the sacred poets of the first half of the seventeenth century—especially Wither, Donne, George Herbert, Henry Vaughan, and Richard Crashaw—occupy a high place in English literature, but all attempts to introduce hymns into public worship were unsuccessful. Three names stand out with some prominence in the generally barren period which now intervenes until the Wesleyan revival—viz. Bishop Ken (1637–1710), whose beautiful Morning and Evening Hymns are still the most popular sacred poems in the English language, and the Dissenting ministers Isaac Watts (1674–1748) and Philip Doddridge (1702–51). The Methodist movement, with its deep personal religion, led to a great revival of hymn-writing, and during the last half of the eighteenth century some twenty hymn-books were published, generally strongly Calvinistic in tone, which came into use in Evangelical and Nonconformist places of worship. The chief hymn-writers of this school were Charles Wesley (1707–88), who wrote “Jesus, Lover of my Soul,” and many other favourite hymns, and A. M. Toplady (1740–78), author of the well-known “Rock of Ages.” Amongst the *Olney Hymns* by Cowper and John Newton, there are a few—such as “Hark, my soul,” “Sometimes a light surprises,” and “God moves in a mysterious way”—which are worthy to rank with these. During the first quarter of the nineteenth century there was a great increase in the number of hymn-books for public worship, all of them distinctly Evangelical or Nonconformist in tone. The publication in 1827 of Heber's *Hymns*, followed soon afterwards by the works of H. F. Lyte and Charlotte Elliott, did much to revive the interest in hymnody, and the movement thus instituted resulted in a general endeavour to raise the standard of the hymns used in the services of the Church. It culminated in 1861 with the publication of *Hymns Ancient and Modern*, a collection which, with a great deal of indifferent work, contains most of the good hymns, representing many shades of religious opinion.

Ever since the days of Luther, whose stirring hymn, *Ein feste Burg ist Unser Gott* was sung by the soldiers of Gustavus Adolphus at the battle of Lutzen, Germany has, before all other countries, been the home of religious poetry. Among the more recent German hymn-writers mention may be made of Novalis, Fouqué, Arndt, the Krummachers, and Spitta. In the Reformed Church of France metrical versions of the Psalms by Marot, Beza, and Conrart were successively employed in public worship from the sixteenth to the eighteenth century, but, as in England, they were finally superseded by hymns.

Hyoid Bone is the bone situated in the neck between the root of the tongue and the upper part of the larynx.

Hyopotamus, an extinct genus of swine-like animals with short canines, comprising several species, found, in rocks of Oligocene and Miocene age, at Hempstead in the Isle of Wight, in France, Switzerland, Dakota, and the Siwalik Hills in India.

The species from the two last-named localities reach a very large size.

Hyoscyamine, an alkaloid occurring in the seeds of certain plants, *e.g.* *Hyoscyamus niger*, Henbane, *Atropa belladonna*, etc., from which sources the substance may be obtained. It possesses the composition represented by the formula $C_{17}H_{23}NO_3$, and crystallises in soluble needles melting at 108.5°C . To this compound, and another of similar composition, *Hyoscine*, the poisonous and medicinal properties of Henbane appear to be due. In many respects it closely resembles *atropine* (q.v.), which is also represented by the same formula.

Hyoscyamus. [HENBANE.]

Hypatia of Alexandria, daughter and pupil of the philosopher Theon, was said to have been the head of the Neoplatonic school of Plotinus. At any rate her learning, virtue, and beauty drew numbers to her lectures. As an ardent opponent of Christianity, and suspected of influencing the prefect of Alexandria against Cyril, the archbishop, she became hateful to the monks, and was dragged by a rabble of them from a street into a church and torn to pieces (415). She is the subject of a historical novel by Charles Kingsley.

Hyperæsthesia, the condition of increased susceptibility to external impressions induced in some forms of disease of the central nervous system.

Hyperbola, in geometry, is one of the conic sections. It is the curve produced by the section of an ordinary right circular cone at any angle to the axis less than that at which the slant edges of the cone cut the axis. Its definition in analytical geometry is that it is the curve every point on which is at a distance from a given point that is a constant multiple of its distance from a given straight line, this multiple being greater than unity. The curve has two identical branches, and extends to infinity in two directions. It has two axes of perfect symmetry, their intersection therefore constituting the *centre* of the hyperbola. The above-mentioned fixed point and fixed line in the definition are called the *focus* and the *directrix* respectively. In every hyperbola there are two foci and two directrices, a pair of each, either of which pairs may be employed to develop the curve. The centre (q.v.) of the hyperbola differs from that of a circle or an ellipse in that tangents may be drawn from it to the curve. Nevertheless, these tangents only touch the curve at infinite distance; they lie in two lines symmetrically arranged about the axes, and are called *asymptotes* (q.v. *see figure*). The fundamental metrical property of the hyperbola may be shown to have the following rendering: the product of the distances of any point on the curve to the two asymptotes, when the distances are measured parallel to these two lines, will be always the same.

Hyperbolic Logarithms. [LOGARITHMS.]

Hyperides (about 385–322 B.C.), one of the ten Attic orators, a pupil of Isocrates and generally a political supporter of Demosthenes in his struggles against Macedonian ascendancy. He was son of Glaucippus, an aristocratic member of the Ægeid tribe, and of the deme Collytus. He soon rose to eminence as a composer of speeches for the law courts, and in 360 B.C. conducted the impeachment of the general Autocles for treason. In 324 B.C., when Harpalus deserted Alexander and endeavoured to incite Athens to a war of liberation, Hyperides was one of the patriots whom the traitor won over, while Demosthenes, seeing that war was hopeless, had Harpalus imprisoned and his treasure seized. On the escape of Harpalus and the implication of Demosthenes in the alleged disappearance of half the treasure, Hyperides was one of the ten prosecutors who procured the condemnation of Demosthenes. But on Alexander's death (323 B.C.) the two patriotic orators were again united in opposition to Antipater and Craterus. Hyperides was mainly responsible for the Samian War, which ended in the disaster of Crannon (322 B.C.). On the demand of the victorious Antipater, Hyperides, with Demosthenes and others, was condemned to death. He fled to Ægina, and thence to Hermione. He was dragged from the temple of Demeter by Antipater's adherents, sent to Athens, and there put to death. The style of his oratory presents an effective mixture of richness and simplicity, of elaboration and ease, and is distinguished for subtlety and humour. The MSS. of his works are papyri found at Thebes in Egypt (1847 and 1856). They are earlier than 300 A.D., and comprise fragments of two private speeches, and of the speech against Demosthenes, and a large part of the Funeral Oration over the victims of the Athenian defeat at Melitæa in the Samian War. This last speech is the best extant specimen of the epideictic oratory of the ancient Greeks. The fragments were edited by F. Blass, Leipsic (1869).

Hyper-metamorphosis, a type of metamorphosis of insects in which an additional stage is present, such as the campodiiform stage of *Mantispa*.

Hypermetropia. [EYE, DISEASES OF.]

Hyperodapedon, an extinct genus of lizard-like reptiles, comprising *H. gordonii*, six or seven feet long, from the Triassic sandstone of Elgin, and *H. huaxleyi*, seventeen feet long, from strata of the same age at Maledi, in India. They appear to have been terrestrial animals with four limbs, but no spines or bony plates. The vertebræ are bi-concave, the ribs single-headed; and there are a well-developed breast-bone and abdominal ribs. The skull is compressed and broadly triangular, whilst the premaxillaries seem to have been prolonged into a sharp recurved beak which must have had a horny sheath like the mandible of a bird of prey. For this reason this and similar extinct reptiles, with the genus *Hatteria*, now living in New Zealand, have been placed in a separate order, *Rhynchocephalia*. The teeth are also very exceptional, there being several rows of closely-set, low, conical teeth on the maxillary and palatine bones, forming posteriorly a deep groove, into which

fit the small marginal teeth of the mandible, which become worn into a sharp cutting edge, whilst there are also larger blunt teeth on the inner side of the mandible.

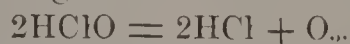
Hypersthene, one of the rhombic pyroxene group of minerals. It is a silicate of magnesium and iron, containing from 11 to 26 per cent. of the former, and from 10 to 34 per cent. of the latter. It crystallises in the Prismatic system, in forms identical with those of enstatite, and has a well-developed cleavage, so as to be very generally foliated. It is brownish green, greyish, or nearly black, with a pearly or coppery metalloid lustre on the cleavage surfaces. It is brittle: but has a hardness of 5 to 6, and specific gravity of 3.3 to 3.4. It may be translucent, and is distinctly pleochroic. It fuses to a black enamel or to a magnetic mass. With labradorite felspar it forms the rock *hypersthene*, and it is a frequent accessory mineral, especially in schists. It occurs largely in the Cuillin Hills of Skye.

Hypertrophy, or overgrowth of an organ results from increased use and increased supply of nutriment. The hypertrophy may be a healthy development, as, for example, in the muscular tissue of an athlete; or it may be the result of an attempt to compensate the mischief produced in some diseased process, as in the hypertrophy of the heart in certain forms of cardiac disease; or the term may be applied to the increase in size of an organ produced by morbid growth within it, as in hypertrophy of the liver, thyroid gland, etc.

Hypha, an elongated cylindrical filamentous structure, either unsegmented (unicellular) or segmented (multicellular), branched or unbranched and increasing by apical growth, which occurs in some algæ and most fungi. Whether segmented or not, a hypha generally contains many nuclei. Loops frequently unite distinct threads, and *clamp-connections*, by a protuberance extending backwards at a transverse wall and joining the next cell, also occur. Fungal mycelium or "spawn" commonly consists of much branched unsegmented hyphæ; and the so-called "compound thallus" of the larger fungi is made up of numerous multicellular hyphæ, either densely interwoven into a felt (*tela contexta*) or parallel and firmly adherent. They then so resemble parenchymatous tissue, the result of cell-division, as to be called *pseudo-parenchyma*.

Hypnotism. [ANIMAL MAGNETISM.]

Hypochlorites are the salts of an unstable *hypochlorous acid*, HClO . This acid is only obtained in dilute solutions, and is readily decomposed on exposure to light:



The hypochlorites themselves show also this instability, and of them the most important is the calcium salt which is contained in bleaching powder (q.v.). The other hypochlorites, as well as the acid itself, possess bleaching powers, all owing to the liberation of oxygen.

Hypochondriasis, a form of disease which sometimes affects middle-aged and elderly men.

The chief symptoms are anxiety, depression of spirits, and there may be actual delusions; it is often associated with dyspepsia. These symptoms may all clear up under appropriate treatment, but in some instances they are associated with the onset of some definite form of organic disease.

Hypocycloid, in geometry, is a special curve traced out by a point on a circle rolling inside another. It is therefore an example of the family of curves known as roulettes (q.v.), and approximates to the ordinary cycloidal curves when the fixed circle is increased in size. [EPICYCLOID.]

Hypoderm, that part of the fundamental tissue in plants immediately beneath the epidermis. It is very frequently thickened so as to add to the mechanical strength of the structure, being in petioles, peduncles, and herbaceous stem-structures commonly collenchymatous, having, that is, the corners of its cells thickened mucilaginously.

Hypogene Action, the collective term for all those geological agencies, several of which are most imperfectly known, which act from below the earth's surface. They may, perhaps, be grouped under five heads:—(1) volcanic, (2) seismic, (3) those producing slow secular or widespread movements, (4) those producing folding and faulting of strata, and (5) metamorphic. How little our certain knowledge of these agencies is, may be gathered from our being only able to name several of them by their effects; but one great cause probably underlying most of them is the heated condition of the interior of the earth. [EARTH.] The action of volcanoes, of earthquakes (seismic action), and of metamorphism is dealt with under separate headings. Secular movements of upheaval or depression may occur in volcanic regions, and be merely a part of the volcanic phenomena, as would seem to be the case with the so-called Serapeum (q.v.) near Naples. If not, they may really be of local origin, as when beds of rock-salt or gypsum are dissolved, and produce subsidence, or when hydration of a mineral substance causes expansion. It has been suggested that elevation may be produced by denudation (q.v.) reducing the pressure on a heated interior; and depression by the weight of deposits on the ocean-floor acting upon a yielding internal region, such as a molten zone between the solid crust of the earth and a solid nucleus. Another view is that all such movements are but the expression of the shrinkage of the earth due to its cooling, the crust accommodating itself to the shrinking interior. Such shrinkage would certainly produce extreme tangential, lateral, or horizontal pressure, and this pressure would give rise to such molar changes as folding into anticlinals (q.v.) and synclinals, contortion, inversion, shearing (q.v.), and faults (q.v.), and to such molecular or textural changes as cleavage (q.v.) and foliation (q.v.). Speaking generally, while the action of *epigene*, or sub-aërial and marine, agencies is denudation (q.v.), lowering the general surface, hypogene agencies tend rather either to raise the surface, to pour out matter from below or to harden rocks (by crystallisation) against denuding forces.

Hypogynous, inserted below the ovary, a term applied to corolla and stamens in certain flowering plants in which the floral receptacle or thalamus retains the typically elongate form of a shoot, not being peripherally expanded into a disc or cup, so that the floral leaves succeed one another in acropetal succession directly upon it. This character is well illustrated by a section of the flower of a buttercup, as contrasted with one through the perigynous (q.v.) flower of a bramble. Insertion is a character of great importance in the classification of angiosperms (q.v.), and hypogynous insertion gives the name *Hypogynæ* to series of Petaloid Monocotyledons, of Incompletæ (q.v.), and of Gamopetalæ (q.v.), whilst the practically synonymous term *thalamifloral* gives the name *Thalamifloræ* to a series of Polypetalous Dicotyledons.

Hyponasty, the more rapid growth of the under surface of a dorsi-ventral organ in a plant, such as a leaf. It commonly alternates at long intervals with epinasty, the more rapid growth of the upper surface. In an ordinary leaf-bud, for example, hyponasty makes the young leaves at first arch inwards over the apex of the stem, and then epinasty causes them to spread outwards and downwards into a horizontally expanded condition. Horse-chestnut leaves are somewhat exceptional in epinasty in their case preceding hyponasty, so that the latter causes them to rise outwards and upwards into the horizontal.

Hyposulphites. These compounds are really the salts of *hyposulphurous acid*, H_2SO_2 , and are of little other than chemical importance. The name *hyposulphite* has been, however, unfortunately applied to the thiosulphates, $\text{H}_2\text{S}_2\text{O}_3$, especially in the case of the sodium salt $\text{Na}_2\text{S}_2\text{O}_3$. This substance is very largely employed in many industrial and technical processes, and especially in photography. For the latter purpose "hypo"—as it is often familiarly called—owes its application to the fact that it forms with silver salts a soluble compound AgNaS_2O_3 , which can be washed out of films, etc., by water. It is therefore used for getting rid of silver compounds which have not been affected by the action of light in the operation known as "fixing" (q.v.).

Hypophosphites, salts of hypophosphorous acid, H_3PO_2 , all of which, like the acid itself, are possessed of strong reducing properties.

Hypothénuse, in geometry, is the side opposite to the right angle in a right-angled triangle. The well-known Pythagoras' theorem, the 47th proposition in Euclid's first book, is that the square on the hypothénuse is equal in area to the sum of the squares on the other two sides.

Hypotricha, an order of Infusoria, including those in which the cilia occur only on the ventral side.

Hypoxanthine, a nitrogenous substance of composition $\text{C}_5\text{H}_4\text{N}_4\text{O}$, which occurs in the animal organism, *e.g.* in the spleen, bone-marrow, muscle, etc. It is usually contained in meat extracts, and frequently found associated with *theine* in tea. It

forms white crystalline needles, which are only slightly soluble in water. In its chemical relations it is closely related to *guanine*, *xanthine*, and *uric acid*, and other products of animal activity.

Hypsometer, an instrument for the determination of heights by observation of the boiling-point of water. It consists of a small boiler heated by a spirit-lamp, and a sensitive thermometer graduated only in the region of 100°C . The thermometer is arranged so that its bulb is in the steam rising from the boiling water. A table of values of atmospheric pressure with corresponding boiling-points of water gives at once the pressure, the difference between which and that at another known level may be employed to calculate the height from that position. The instrument is arranged in telescopic form for convenience of packing.

Hypsophyll, or HYPHOPHYLLARY LEAF. [BRAC.]

Hyracodon, a genus of rhinoceros-like animals found in the Miocene rocks of Dakota, and described by Professors Leidy and Cope. They have the same number of teeth as the Rhinoceros (q.v.), though of a more generalised type, but only three digits on each foot.

Hyracoidea, a sub-order of Ungulates, with a single family Procaviidæ (= the lapsed Hyracidæ). The dental formula is $1\frac{1}{2} \text{C}_0^0 \text{PM}_4^4 \text{M}_3^3 = 34$. There are four functional digits on the fore limbs, and three on the hinder ones, each with a hoof-like nail. The brain and skull are of the Ungulate pattern, and the cheek teeth like those of the Rhinoceros.

Hyrax, the English name of any individual of the genus *Procavia* (of which it is a synonym). There are fourteen species (three with sub-species), ranging from Syria down the east coast of Africa to the Cape, and up the west coast to the Senegal river. In form they are not unlike the marmot, but are larger and more stoutly built, and the soft fur is brown or grey in colour. They are social in habit, and live among rocks or in trees, and their diet is exclusively vegetable. The upper lip is cleft like that of the rodents, and the formation of the feet enables them to cling to vertical surfaces, as do the Geckos. They are extremely wary, and place sentinels to give warning of approaching danger; but when taken they soon become accustomed to captivity, and make amusing and affectionate pets. The Syrian Hyrax (*P. syriaca*) is the "cony" of Scripture, and the mistaken notion of the Jews that it chewed the cud probably arose from the fact that its jaws move almost incessantly like those of a ruminant. *P. capensis* is the Cape Hyrax or Rock Badger; *P. arboreus* and *P. dorsalis* are arboreal forms, formerly placed in the genus or sub-genus *Dendrohyrax* (from south-west Africa).

Hyrcanus, High-priest of the Jews (B.C. 78–30), succeeding his father, and king (B.C. 69–47), succeeding his mother Alexandria, was the last prince of the dynasty of Joannes Hyrcanus, son of Simon Maccabæus. Hyrcanus' younger brother, Aristobulus, rebelled, and drove him from the throne. Pompey restored Hyrcanus' power (63), and took Aristobulus and his son to Rome; but they escaped, and their

rebellious attempts gave the real sway over Judea to Antipater, an Idumæan, whom Cæsar (47) made Procurator of Judæa. Hyrcanus had Antipater removed by poison (43); but weakly allowed Antipater's son, Herod, to succeed to his father's power. The Parthians carried off the feeble Hyrcanus (40), and detained him in Babylon for several years, but at last he returned to Jerusalem at Herod's invitation. He was put to death by Herod (30) after the battle of Actium.

Hyssop, a genus of Labiate plants, one of which is a native of Southern Europe. Though rather bushy herbs, they are not adapted for brooms or brushes, nor do they grow on walls; and it is probable that the hyssop of Scripture is the spinous twigs of the caper (q.v.).

Hysteresis (*coming short*), a phenomenon of magnetic induction exhibited strongly with ordinary soft iron, by which the intensity of magnetism of the metal when subjected to a varying magnetising force depends not only on the strength of this force but also on the nature of its previous variations. [INDUCTION, MAGNETISM.]

Hysteria is a disease which occurs chiefly in women either at the period of puberty or at that of the climacteric. The characteristic symptom of hysteria is the well-known hysterical fit, the broad features of distinction between which, and an epileptic attack, are the absence of the complete loss of consciousness, of tongue-biting and of lividity, and the noisiness and violence of movement, but avoidance of the infliction of any actual injury, which occur in a hysterical attack. The distinction is not, however, an easy matter in all cases. Other symptoms met with in hysteria are the altered mental condition, perverted sensation (whether it take the form of exalted sensibility, *hyperæsthesia*, or loss of sensibility, *anæsthesia*), paralysis, and loss of voice. The treatment of hysteria is usually a question of moral influence rather than of drug administration.

Hysteron-proteron (Greek, "the latter first"), is the name given to a figure of speech in which what should, logically or in order of time, come first is placed last and *vice versâ*; the idea being to emphasise the notion more prominently in the mind.

Hystrix. [PORCUPINE.]

Hythe, a municipal and parliamentary borough and watering-place of Kent, one of the old Cinque Ports, now half a mile from the sea, on a branch line of the South Eastern Railway. The fine church dedicated to St. Leonard, late Norman and Early English, has been handsomely restored. It stands on the slope of the steep hill which rises behind the long street of which the town mainly consists. The parliamentary borough includes Folkestone, which is five miles to the east; a Government school for training instructors in musketry and marksmen was founded in 1854, when fine baths were built; a noble avenue of wych-elms leads from the town to the sea-wall and parade, which extend to Sandgate.

I.

I, the ninth letter of our alphabet, was derived through the Greeks from the Phœnicians, and ultimately from the Egyptian hieroglyphics. Its original form somewhat resembled a *z*, which became a vertical stroke after the omission of the additional strokes forming the upper and lower angles. The proper sound of *i* is that which it has in *machine*—a sound which still belongs to it in most European languages, but which in English now gives its name to the letter *e*. This sound appears in a weakened form in the "short *i*" of *bit*, etc., which is the normal sound of the letter in English, whereas that from which it takes name occurs only when a final *e* or a guttural follows in the next syllable—*e.g.* *bite*, *high*. [J, Y.]

Iagnobs, a people of East Turkestan, who give their name to the Iagnob affluent of the Upper Zerafshan river; they are of Galcha stock, and the only known member of this group who speak a distinct Aryan language unintelligible to all the surrounding Galchas, who are of Persian speech. Like their neighbours, the Iagnobs are Moham-medans of the Sunni sect, occupied chiefly with stock-breeding. (Ch. de Ujfalvy, *Rev. d'Anthropologie*, 1879, Jan., p. 8.),

Iambics, verses in which the normal form of each foot is an *iambus*, *i.e.* a short syllable followed by a long one. They are said to have been invented by the Greek poet Archilochus (q.v.). Substituting stress for quantity, English blank verse consists of iambic lines, each containing five feet.

Ibanags, a Malay people, Philippine Archipelago, province of Cagayan, island of Luzon and neighbouring Babuyan and Batanes islets. The Ibanags, whose language is the chief medium of intercourse between the settled populations and the surrounding wild tribes, are a fierce, warlike nation, whose reduction cost the Spaniards more trouble than that of any other people in Luzon. Those of the Batanes Isles are still mostly pagans; but nearly all the rest have been nominal Roman Catholics since the end of the sixteenth century. They cultivate tobacco and rice, own large herds of swine and goats, and emigrate in considerable numbers, especially to Manila. (Fr. Blumentritt, *Ethnologie der Philippinen*.)

Ibaras, a people of Madagascar, south and south-west districts of the province of Betsileo. Like the allied Betsileos of the central districts, they live in the so-called *valas*, that is, groups of three or four huts, each surrounded by a mud wall and a quickset cactus hedge. The Ibaras are still for the most part nature worshippers, and, according to J. Mullens, who visited them in 1875, number about 200,000 souls. In their territory is the remarkable Mount Ivahibé, an isolated table with a lacustrine depression on the summit whence, during the rainy season, the lake sends its overflow through a wild gorge and magnificent cascade down to the surrounding plains.

Iberis, a genus of cruciferous plants, comprising about twenty species, natives of Europe, Eastern Asia, and Northern Africa, of which one, *Iberis amara*, is British. They are smooth plants, with crowded flat-topped inflorescences of flowers which, though sometimes pink or red, are usually white, whence they are known as "candy-tuft." The outer flowers are remarkable for having their two outer petals larger than the others.

Ibex. [GOAT.]

Ibilaos, a wild tribe, Philippine archipelago, who occupy both slopes of the Caraballo Sur range between the provinces of Nueva Vizcaya and Nueva Ecija, island of Luzon. The Ibilaos appear to be half-caste Malays and Negritos, of dwarfish size and very dark complexion, cultivating no land, but living entirely on the chase, and also given to head-hunting, like so many of the uncivilised Malay peoples. A few of their hordes have been reduced, and now live in peace with the settled populations of Nueva Ecija. (Fr. Blumentritt.)

Ibis, a genus of Stork-like birds of the family Plataleidae, of varying extent in different classifications. As a popular name it is applied to some thirty forms, not much unlike curlews in shape, most abundant in the tropics, though some are almost cosmopolitan, and others are from the temperate parts of America. They have the following characters in common: the neck is long and generally naked, the head is small, with a long sickle-shaped bill, curving downwards; the legs are long and thin, the toes of moderate size, the three in front connected by a short membrane, and armed with narrow pointed claws, the middle one denticulated. The wings are long, broad, and rounded, and the short tail is of twelve feathers. The general



IBIS (*Ibis ethiopica*).

plumage is white with black primaries, and in some the wing coverts are elongated and form a plume covering the tail. They feed on frogs, lizards, molluscs, and water insects. The best-known is the Sacred or Egyptian Ibis (*I. ethiopica*), about thirty inches long, formerly venerated in Egypt, of which country it is now no longer a native, only

straying thither from other parts of Africa. It is often seen in confinement. The Glossy Ibis (*I. falcinellus*), ranges from Africa and Asia into Southern Europe, and has strayed to Britain. Montagu says that it is the original of the "Liver" that figures in the arms of Liverpool. The White Ibis (*I. alba*) is a native of Florida, and the Scarlet Ibis (*I. rubra*) of tropical America.

Iblis (EBLEES), the Devil of the Mohammedans, Originally an angel, he was cast out of Paradise for refusing to worship Adam. (*The Korán*, ch. vii.). [EBLIS.]

Ibn Batuta, a famous Mohammedan traveller, who appears to have been born at Tangier in 1304, and to have died there at the age of seventy-three. From 1325 to 1355 he was incessantly engaged in travel, and the record of his adventures, if marked here and there by apocryphal incidents, bears the stamp of truth in the main. His itinerary begins along the south coast of the Mediterranean and, striking inland to Cairo, extends to Damascus, Mecca, Ispahan, Bagdad, Aden, Mombassa, Quiloa, and the Persian Gulf. He then worked his way back to Egypt and thence through Syria and Asia Minor to the Black Sea. Joining the chief, Mahomed Usbez, he saw a good deal of Russia, visited Constantinople, and then starting from Sarai struck across the steppes, traversed Khorassan and Cabul, climbed the Hindu Kush, and reached the Indus. He next found his way to Delhi, of which city he was for eight years *Kadi*, and being despatched on a mission to China, professed, after wanderings which took him through much of India and the Eastern Archipelago, to have got as far as Cambaluc or Pekin. Coming home at last, after an absence of twenty-four years, he finished up with a little trip to Timbuctoo and the Niger, and then settled down to write his adventures.

Ibo (IGBO), a large Negro people of the Lower Niger basin, whose domain comprises all the northern part of the delta, extensive tracts in Yorubaland, and most of the space intervening between the head of the delta and the Oyono (Cross) river above the Old Calabar estuary. The Ibo language, which is spoken by several millions on the Slave Coast and in the Oil Rivers Territory, is fundamentally connected with the Ewe of Dahomey and the Tshi of the Gold Coast. There are many distinct dialects, but the form current along the banks of the Lower Niger has become the literary standard, having been adopted by the missionaries for their translations of the Bible, grammars, and dictionaries. So numerous were the blacks of Ibo speech formerly shipped to the American plantations that all those exported from the Slave Coast were indifferently called "Ibos." Many have been evangelised; but the great majority are still heathens, worshipping Chuku, a powerful demon, who dwells partly in a cave, partly in the sky, thus keeping one eye on the earth, the other on the starry firmament. Till recently he was offered human sacrifices—generally young girls—who were dragged to death in his honour and then thrown to the crocodiles. Amongst the Ibos the social classes

are distinguished by special tattoo markings, one of which is a sort of visor formed by the skin of the forehead brought down over the eyes. The highest class, limited to very few members, are known by the tinkling bells attached to their legs when they go abroad. Lately the Ibos have recognised the suzerainty of the British Chartered Companies, and have engaged to give up most of their former barbarous customs. (Reclus, English ed. xii., p. 330; Baikie, *Exploring Voyage*, p. 307; Bishop Crowther, *Journals*, p. 355.)

Iboguelans, a small but fierce Tuareg (Berber) tribe, "the terror of the Sahara" (Duveyrier). They are a branch of the powerful Kel-Rhela family, and have their camping grounds on the western slope of the Ahaggar plateau, whence they swoop down on the caravans along the trade route between Timbuktu and the Twat Oasis. The Iboguelans belong to the noble class of Tuaregs, and consequently do no work, but hold in subjection the two servile Imesseliten and Iberbêren tribes, who till the land, tend the flocks, and do all the manual labour. (H. Duveyrier, *Les Tuareg du Nord*.)

Ibsen, HENRIK, was born at Skien, Norway, in 1828, and derived from his mother a strain of German and Scottish blood. He was educated for the medical profession, but soon took to literature, his first effort being a drama, *Cateline* (1850), which was not successful. Next year, whilst a student in the university of Christiania, he started a paper in which he wrote his earliest social and satirical play, *Nora, or A Doll's House*. He was appointed manager of the theatre at Bergen in 1852, and went to Christiania in the same capacity five years later. It was not until 1862, after the financial failure of the theatre, that he adopted the functions of a dramatic satirist, and began to illustrate his psychological and social theories in the series of creations that has made him famous. *Lore's Comedy* (1863) marks the turning-point of his career. His two great poems, *Brand* and *Peer Gynt*, appeared in 1866-67. Between 1877 and 1893 he has given to the world *The Pillars of Society*, *Ghosts*, *An Enemy of Society*, *The Wild Duck*, *Rosmersholm*, *Hedda Gabler* and *The Master Builder*. All of these have been translated into English, and most of them have been put upon the stage in this country, where they are still the subjects of excited criticism. Ibsen never forgave his country for holding aloof from Denmark in 1864, and has lived abroad for nearly thirty years, part of this period being spent in Italy, part at Munich. The best account of his career is that by H. Jaeger, which exists in an English form.

Ibycus, a Greek lyric poet of whose works but few fragments remain. He was a native of Rhegium in Italy, but flourished at the Court of Polycrates of Samos about 540 B.C. He is said to have been killed by robbers near Corinth, and to have called with his dying voice upon a passing flock of cranes to avenge him. The murderers were soon after seated in the theatre when the cranes put in an appearance. One of the guilty wretches inadvertently cried out "See! the avengers of Ibycus!"

and thus betrayed himself. "The cranes of Ibycus" became a popular proverb among the Greeks.

Ice, the solid crystalline form of water (q.v.) which that substance assumes at a low temperature, originates in many different ways in nature. Precipitated from the air as hoar-frost (q.v.), hail (q.v.), or snow (q.v.), accumulating in this latter form above precipices to fall as the avalanche (q.v.), or, on more gradual slopes, to glide as the glacier (q.v.) until, perhaps reaching the sea, it breaks off in the iceberg (q.v.), forming in deep or elevated and sunless caverns, on the open surface of fresh water, on the sea itself, or, as ground-ice, at the bottom of the water, it naturally presents many varied characteristics. The temperature at which it forms, under ordinary conditions of pressure, is the zero (0°) of the Centigrade and Réaumur thermometer-scales, and is 32° Fahrenheit. By melting out single negative crystals with a beam of electric light it is shown that sheet-ice is equally with snow made up of crystals of hexagonal type. Water expands in freezing, its maximum density being attained at 39° F. or 4° C.; and though ice, so long as it remains ice, behaves like most solids in contracting in cooling and expanding when heated, in melting it contracts. Its specific heat is about half that of water—i.e. the heat required to raise 1 lb. of ice through 1° C. is only sufficient to raise half a pound of water through 1°. In the melting of ice there is no rise of temperature, but 79.25 heat-units are rendered *latent* in the process, or are employed merely in changing the condition of the solid into that of a liquid, without any increase of temperature—i.e. it takes as much heat to convert 1 lb. of ice at 0° C. into water at 0° C. as would raise 1 lb. of water from 0° C. to 79.25° C.

When two blocks of ice at 0° C. are pressed together, melting takes place, heat is absorbed, the pressure is momentarily relieved, and the resulting water re-freezes, so that the two blocks become welded in one. This process, which is known as *regelation*, explains the "binding" of a snow-ball and, to a considerable extent, the flow of a glacier.

Fresh-water, when cooled by contact with cold air down to 4° C., sinks, and not until the whole mass is reduced to that temperature, so that further convection currents are impossible, does ice form at the surface. Sea-water, when stagnant, freezes at about -2° C. or 29° F., and in so freezing precipitates most of its salt, much as dirty water throws down most of the mud it contains. Water, whether fresh or salt, resting on an uneven bed, such as that of the Baltic, the Gulf of St. Lawrence, the Upper Thames, and the Christchurch Avon, is apt to form what is known as *ground-ice*, *bottom-ice*, or *anchor-ice*, cakes of ice forming from radiation in contact with large stones, or even anchors, at the bottom, especially in relatively stagnant holes, and often floating them to the surface. Along the sea-coast or on the banks of tidal rivers a ledge of ice is often formed, by a similar process of radiation, adherent to the bank at the highest tide-level,

which is known as *ice-foot*. It may be subsequently floated off, or lifted by a fresh layer formed below it and reattached still higher, thus forming a thick shelf on which *débris* due to frost-action may accumulate. Masses of ice-foot when detached form small flat bergs. When, in polar regions, the surface of the sea freezes it is known as *floe* (meadow) *ice*. Wave-action commonly breaks this up and heaps it in an irregular manner that much impedes the transit of Arctic explorers. When the floe-ice breaks up in summer, "canals" forming throughout it, it is known as *pack-ice*, and it is the violent collisions of masses of this pack that so frequently "nip" and destroy vessels.

Iceberg, a mass of ice detached from a glacier where it enters the sea. Icebergs vary greatly in shape and size, lofty peaked forms, sometimes 200 or 300 feet above the water, being the more common. In the Antarctic Ocean huge and regular tabular bergs occur, sometimes five miles in length, and presenting a stratified appearance, the ice becoming denser and darker blue downwards. Only about an eighth part of an iceberg is above water, so that in shallow water they may run aground, ploughing up the sea-bottom. They are generally strewn over with stones of all sizes up to that of a house: cascades of water pour from their melting summits; and they transport Arctic bears and foxes occasionally, besides affording a retreat to seals. In the North Atlantic the bergs are carried by ocean currents to the shores of Newfoundland, or farther south; and, as they often, by cooling the surrounding air, shroud themselves in mist, they form a serious danger to navigation. The melting of the submerged portion frequently causes icebergs to capsize.

Iceland (Dan. ISLAND) is a volcanic island in the North Atlantic Ocean, 500 miles from Scotland, and 250 miles from Greenland. It has a length of 300 miles, and a breadth of 200, the area being about 39,200 square miles. All the central portion is occupied by a vast plateau raised about 2,000 feet above sea-level and presenting a dreary expanse of sand and lava broken by jökulls or ice-mountains reaching in some cases a height of 6,500 feet. The largest of these, Vatnajökull, lies to the S.W. and covers 4,000 square miles. Its E. margin approaches closely to the sea, but on the other side the country opens out into valleys until, on passing the ridges of Hecla, the Torfajökull and the Eyafjallajökull, the Rangarvalla, an extensive and well-watered plain, is reached. This communicates with the valleys that fringe the bay of Faxaflói, in the S. bend of which stands Reykjavík, the capital. The promontory of Snafellsness divides Faxaflói from the Breidifjörður inlet, and the N.W. corner of the island consists of a rugged peninsula. The N. coast beyond is deeply indented with fiords, whilst the S. shore offers but scanty harbour accommodation. The inhabitable portion of the island seldom extends more than 50 miles from the sea, and the soil yields little but grass, on which the sheep, cattle, and ponies—the chief sources of livelihood—are pastured. Spade husbandry produces a few potatoes, carrots, and turnips. Fish abounds both

in the sea and the numerous streams, and the down of eider-duck supplies a valuable export. There are no industries, save the spinning and weaving of coarse woollen fabrics. A little sulphur is worked, and the bogs yield peat for fuel, but such mineral resources as exist—iron, aluminium, spar and lignite—hardly pay for development. The climate, especially in the S., is by no means severe, the winter temperature averaging about 30° Fahrenheit, but the N. littoral is colder and dryer. The air is clear, bright, and invigorating. Traces of volcanic agency of older or later date are discernible everywhere, and within the



MAP OF ICELAND.

memory of man at least twenty-five craters have been in active operation, but Hecla has been quiescent since 1846, and the Katla was the scene of the last eruption in 1860. Earthquakes occur frequently, being felt most sharply in the W., and geysers are found in several quarters.

The recent constitution, dating from 1874, bestows the legislative power on the King of Denmark and the Al-thing or Representative Assembly, which is made up of 30 elected members and 6 others, nominated by the Crown, and is divided into two chambers. A governor-general, two lieutenant-governors, for the two parts of the island, and a number of sheriffs form the executive and judicial staff, whilst there are local councils for the administration of the poor law and for similar purposes. A secretary at Copenhagen acts as an intermediary between the colonial and the home government.

Ethnology. It appears from the Norse records and other indications that the first inhabitants of Iceland were a few Irish Christians, who, however, were all expelled by the pagan Norsemen who, flying from the tyranny of the Norwegian usurper Harald Haarfager, arrived in the island soon after 872. Others followed, also mostly from Norway, down to the year 1000, when all accepted the teachings of the Christian missionaries Gizur and Hialti. Then immigration virtually ceased, or was later restricted to a few Danish officials and others when the island passed from Norway to Denmark by the treaty of Kalmar (1397). Thus it happens that the great bulk of the present inhabitants are direct descendants of those early Norwegian settlers, whom they still resemble in physique and language. The modern Icelanders are generally of tall stature, with round faces, blue or grey eyes, long flaxen or brown hair, coarse figures and ungainly carriage. Infant mortality is high, even excessive in some districts, and appears due partly to the increasing rigour of the climate, partly to close unions, unsanitary conditions, premature weaning, and coarse and unwholesome food. This, combined with

emigration to the United States and Canada, tends to keep the population stationary or even to reduce it (71,300 in 1876, 72,438 in 1880, 70,927 in 1890).

The Icelanders are distinguished by their intelligence, love of study, personal dignity, reserve and courage; but they are said to be excessively suspicious, quarrelsome and apathetic at home, though active and enterprising abroad. Thanks to their isolated position and the general spread of education, they have preserved with little change the old Norse (Norwegian) language of the 9th century, which was considerably cultivated, especially in the 13th and 14th centuries. From this period dates the composition of all their literary monuments collectively comprised under the name of *sagas* ("sayings"), and embodying mythological and national epics and other poems, histories, as well as didactic prose works, such as the prose Edda attributed to the poet and historian Snorro Sturleson, and containing treatises on mythology, grammar, rhetoric and the laws of Norse versification. The poetic forms were exceedingly complex and artificial, so that poetic composition soon degenerated into literary *tours de force* lacking all natural feeling and retaining merely the dry bones of the early national poetry. In more recent times the Icelanders have distinguished themselves in other branches of art and science, and the father of the Danish sculptor Thorwaldsen was a native of Iceland.

Iceland Moss (*Cetraria islandica*), a lichen, native to Iceland, Scandinavia and mountainous districts of Britain and Europe generally. It is ground up with flour and added to soups in Iceland; but is little used there, and is not exported. It is, however, collected in Sweden as a food and medicine. It contains 70 per cent. of *lichenin*, a mucilaginous modification of starch, and a bitter acid principle which may have some slight medicinal properties, but is usually removed by soaking the "moss" in water or dilute solution of carbonate of soda. Iceland moss, when boiled, forms a jelly which is mixed with wine or milk; or it is ground up with cocoa; and it is supposed to be useful in pulmonary complaints; but is merely demulcent and very slightly nutritious.

Iceland-spar. [CALCITE.]

Ice-plant (*Mesembryanthemum crystallinum*), a native of South Africa, the Canaries, and Greece, so named from the water-containing glands, resembling particles of ice, with which the trailing, fleshy stem and the leaves of the plant are studded. These glands also feel cool, so that the plant is often used as a garnish to dessert dishes. Large quantities are burnt in the Canaries, the ashes being exported to Spain for glass-making.

Ice-spar, the naturally - occurring double fluoride of soda and aluminium, Na_2AlF_6 , found chiefly in Greenland, and more commonly known by the name of *eryolite* (q.v.).

Ichang, YCHANG or YLIN, a town in the province of Hoo-pih, China, about 370 miles above Hankow on the Yang-tze-Kiang. Since it was opened to foreign

trade by the treaty of 1877 the business has increased enormously, especially in trepang.

Ichneumon, any individual of the genus *Herpestes*, of the Civet family, with twenty-two species from Asia and Africa, one straying into Spain. They resemble weasels in form, but are of larger size, and feed on small mammals, reptiles, poultry, eggs, and insects. The Egyptian Ichneumon (*H. ichneumon*), rather less than three feet long, has grey fur, and the muzzle and paws black. It has long been domesticated, for killing rats and mice, and was venerated by the ancient Egyptians. The so-called Andalusian variety is identical. The MongOOSE (*H. griseus*), an Indian species, is rather smaller. It is a great destroyer of serpents, but the stories told of its seeking a remedial herb when bitten are fabulous.

Ichneumon Flies (*Ichneumonidae*), a family of Hymenoptera, of which the larvæ are footless and live as parasites in the tissues of other insects.

Ichthyodorulites, the strong, bony, defensive spines of fossil shark-like fishes. Except in one or two Carboniferous genera, in which they were attached to the pectoral fins, these spines were imbedded in the muscular tissue in front of the dorsal fins. They were formidable weapons, sometimes nearly a foot long, and furnished with recurved denticles, capable of inflicting a serious wound. Their variously-ribbed or tuberculate exposed surface is enamelled with ganoinc. In some cases, as in the living *Chimæra*, they have a broadly-expanded wing-like base imbedded in muscle. Many of them have not been with certainty correlated with particular skeletons; but in other cases they have been found in their natural position.

Ichthyopsida, the lowest of three primary groups of True Vertebrates, containing the fishes and amphibians. Respiration takes place by gills during part or the whole of life.

Ichthyosaurus, the fish-lizard, the only genus of an extinct order of reptiles, the Ichthyopterygia. More than thirty species have been described from the Secondary rocks of the Old World, especially from the Lias, and, very perfect specimens of both young and adult forms having been obtained, their anatomy is very completely known. They are sometimes thirty feet long, and somewhat resemble the dolphin in general form. The head is large, having a long, gavial-like snout and very large orbits; but a very small brain cavity. The jaws, sometimes six feet long, may contain over 180 teeth, which are conical, and are not in distinct sockets, as in the crocodile, but in a common alveolar groove, and can be replaced from below. The eyes are surrounded by bony sclerotic plates, like those in turtles, owls, etc., the whole orbit sometimes reaching fourteen inches in diameter. The neck is so short as to be probably invisible externally, and the numerous vertebrae are deeply biconcave, like those of fishes. The tail is long and tapering; and from its extremity being generally found in a dislocated condition, Owen assumed a large vertical caudal fin, the presence of which has been recently demonstrated in exceptionally perfect specimens. The

limbs are short, the hind ones being the smaller, and they terminate in paddles with rows of marginal ossicles in addition to the five usual digits. There are numerous slender ribs, but no breast-bone. Traces of the skin have been found, and show no sign of scales or bony plates. The discovery of half-digested remains of fish, reptiles, and young ichthyosaurs within their ribs and in their spirally-convoluted coprolites (q.v.), which are two to four inches long, point to the predatory habits of the animals. They may have crawled on land, like seals; but were adapted for deep water, being better able to remain under water than warm-blooded animals such as whales or seals.

Iconium (Gr. IKONION, mod. KONIEH), an ancient city of Asia Minor, formerly the capital of Lycaonia, and now of the Turkish province of Karaman, is situated 310 miles east of Smyrna on the edge of the great central plateau. On the highway between Antioch and Derbe, and surrounded by a fertile country, it became a place of importance even in the time of Xenophon. St. Paul founded a Christian church here, and thrice visited the spot. The walls of the old city may still be traced within the circuit of those erected in the thirteenth century, and the ruins of the citadel and of the Byzantine church of St. Thecla may be seen amongst mosques and shrines of a later date. There is some trade in carpets and morocco leather, but the former prosperity has dwindled away under Turkish rule.

Iconoclasts, "image-breakers" (Greek *eikon*, "image" and *klazo*, "I break"), a party opposed to the presence of statues and pictures in churches which arose in the Eastern Church at the beginning of the eighth century. A feeling against images, occasioned mainly by the fear of idolatry, had existed from an early period, and their use was forbidden by the Council of Elvira in Spain (306). But a great variety of opinion and practice prevailed, culminating at last in a bitter controversy in the reign of Leo III., "the Isaurian," Emperor of the East. By his decree in 730 the worship of images was made a capital offence, and it was ordered that they should be removed from churches. Leo's violent measures were opposed not only by the Popes Gregory II. and Gregory III., but by the Patriarch of Constantinople and his clergy. The hostility they encountered in Venice and Ravenna resulted in the loss of the Italian possessions of the Eastern Empire. Constantine Copronymus, son of Leo, pursued the same course, and in a council of Eastern bishops at Constantinople (754) the previous enactments were confirmed. Owing to the influence of the Empress Irene (q.v.), image-worship was re-established at the Deutero-Nicene Council (787); but her successors at Constantinople were for the most part jealous iconoclasts, and the difference between the Eastern and Western Churches on this point contributed, though in a less degree than the *Filioque* controversy, to their final separation. [GREEK CHURCH.]

Ida. 1. A mountain in Asia Minor at the head of the gulf of Adramyti, and thirty miles south-east of the Trojan plain. Here Paris wooed Ceneone, and

adjudged the prize of beauty to Venus, bringing ruin on himself and his country. It is now known as Kash-Dagh.

2. The central peak of the island of Crete, the modern name being Psitoriti. As the cradle of Jupiter and the home of his attendants, the Corybantes, it is sometimes confounded with the Trojan Ida. It has an elevation of 7,200 feet.

Idaho, one of the United States, organised as a territory in 1863, and formed by uniting part of the east of Washington and Oregon with slices taken from the west of Nebraska and the north of Utah, so as to make up an area of 86,294 square miles. It adjoins British Columbia to the north. Much of the surface is mountainous and woody, but there are broad and fertile valleys, especially in the north. Towards the south vast tracts are covered by recent basaltic eruptions. Many streams flow down from the Rocky, the Bitter-root, and the Salmon river chains, the largest being the Snake, the Salmon, the Clearwater, and the Spokane. The climate is very dry. Boisee, Idaho City, Malade, Buenavista, and Silver City are the chief centres of population. The mineral resources include gold, silver, copper, iron, coal, and salt, all of which have been worked profitably. The railway from Utah to Montana traverses the lower portion of the territory. It was admitted as the forty-third State of the Union in 1890.

Ida-u-Aish (DWAÏSH), a large group of confederate Tuareg tribes, West Sahara, extending southwards to the banks of the Senegal. As descendants of the old Guesima Confederacy, they were formerly the most powerful of all the Tuareg people in this region; but owing to internal strife they lost their pre-eminence early in the sixteenth century. At present they are divided into two hostile factions, the *Sherâtits* and *Abakâks*, scattered in isolated communities as far north as the Sus Valley, Morocco.

Ida-u-el-Haj, a widespread group of Tuareg tribes, West Sahara, most of whom are descendants of the ancient Zenaga family; they have played an important part in this region as propagators of Islam and founders of the Mohammedan kingdom of Walata in El-Hodh, at that time inhabited by Negroes from Sûdan. They are divided into numerous factions, one of which, the *Ahel Sidi Mahmûd*, were formerly masters of Adrâr, where their chief settlement was the flourishing market of Wadân. These all claim to be Marabonts, and as such have great influence over the Sherâtit division of the Ida-u-Aish confederacy.

Iddesleigh, THE RIGHT HON. STAFFORD HENRY NORTHCOTE, EARL OF, G.C.B., was born in 1818. After a distinguished career at Eton and Balliol College, Oxford, he became private secretary in 1843 to Mr. Gladstone, then President of the Board of Trade. In 1851 he succeeded to the baronetcy, and in 1855 entered Parliament as Conservative member for Dudley. In 1859 he became Financial Secretary to the Treasury under Lord Derby, and gave proof of high administrative talents. In 1866 he accepted the Presidency of the Board of Trade, whence

he was transferred two years later to the India Office, where he directed the Abyssinian War with conspicuous skill. Mr. Gladstone, though no longer a political ally, sent him to America in 1871 for the purpose of conducting the *Alabama* negotiations, and on Mr. Disraeli's return to power in 1874 he was made Chancellor of the Exchequer. On the elevation of his chief to the peerage, he took his place as leader of the House of Commons. After Lord Beaconsfield's death he became Lord Salisbury's partner and possible rival in the control of the party. In 1885 he was created a peer, and in 1886 was invited to accept the direction of Foreign Affairs. He soon resigned office, however, and died suddenly a few days later in 1887.

Idea. In the Platonic philosophy the *idea* or *eidos* is the eternal and unchangeable archetype to which all the objects forming a class conform. The world of sense is in a state of perpetual flux—ever coming into existence and ceasing to be—it is the sphere of the *non-existent*, and material objects are real only in so far as they partake of the nature of their *eidos*. The ideal world extends wherever there is anything capable of becoming an object of thought; there are ideas of beauty, justice, and truth, as well as of a man, a house, or a tree. All the other ideas culminate in the *Idea of the One*, the Divine Being which is the source of all other being. When the word “idea” was used in this sense, Idealism and Realism were identical, and the mediæval schoolmen who supported the Platonic view were rightly called “Realists.” [NOMINALIST.] But with the growth of modern philosophy “idea” assumed a totally different meaning. It was now used by Locke, as previously by Descartes, to denote any presentation or representation in the mind—“whatever is the (immediate) object of the mind in thinking”; while Hume confined it to representations in the mind produced by memory or association, as opposed to impressions which are the direct result of sense-perception. The idea thus came to be regarded as a peculiar property of the mind, and, when schools arose which denied the existence of a material world, they were called “idealists,” the notion being that they reduced all existence into “ideas,” mental products independent of any agency save that of some mind. On the other hand, those who maintained that the external world has an independent objective existence became known as “realists.”

Idiocy. Mental weakness occurring in the infant or child, prior to the development of the reasoning faculties, must be distinguished from *dementia*, which is the condition of mental weakness occurring in the adult. Idiots are not infrequently the offspring of a marriage between near relations; in some instances the disease is hereditary in the sense that other members of the family are affected with one or other form of insanity. It may be directly traceable to injury, and is often associated with epilepsy. The child affected is dull and stupid, he speaks imperfectly or not at all, merely uttering meaningless sounds. His memory is very feeble, and he is incapable of feeding or clothing himself and the like. Much can be

done by appropriate training and education in some instances, hopeless as the condition might at first sight appear.

Idmonea, the type genus of the *Idmoniidae*, a family of Cyclostomata (q.v.), including many of the more graceful, delicate, branching tufts.

Idolatry is the worship of *eidōla*, or images, generally as the conscious representatives of supernatural beings; and the origin of this practice seems natural enough, if one considers how even the average man of the nineteenth century prefers the concrete to the abstract. In races of low culture the idea of supernatural beings must have been evolved slowly and with great difficulty, and the embodiment of this idea in any figure, however rude, of a man, or even of one of the lower animals, marked a distinct advance in the path of religious evolution. For this reason idolatry is not found among races of the lowest culture; and in most cases Fetishism (q.v.) seems to have served as an intermediate stage between Animism (q.v.) and Idolatry, but is distinctly inferior to it in this respect—the mere possession of a fetish gave its owner power to compel the indwelling deity, while the being represented by an idol was to be implored. One gets a glimpse of this important distinction even in stock- and stone-worship, for the priests of Baal in their memorable contest with Elijah cried out in the presence of the standing stones on Carmel, “O Baal, hear us!” (1 Kings xviii.). This distinction, however, is not always found, as may be seen from Rachel's theft of her father's *teraphim*, where the idea of possession seems to be the dominant one, for she “put them in the camel's furniture, and sat upon them” (Gen. xxxi.). The range of idolatry is wide: it is common among the savages of Polynesia, and it flourished in ancient Greece amid the highest civilisation the world has seen; for while to the philosophers—who knew that though “the people had many gods, there could be but One”—the statues of the divinities were at best but symbols, to the bulk of the Greeks they were personifications of or animated by the dwellers on Olympus. It is present, in a greater or less degree, in all forms of religion except the lowest and those based on Monotheism, and even in these last it often creeps in, either from the limitations of the human mind, or by a process akin to that of degeneration in the animal kingdom. Long after worship of Jehovah had become national we find the Jews constantly lapsing into the idol-worship of the Gentiles around them, endeavouring to bring in “strange gods,” even proclaiming, as did Aaron, the day on which the idol was to be worshipped as a “feast to the Lord” (Exod. xxxii. 5). And this continued to later times, for in Isaiah (lxiv. lxx.), after a purely monotheistic declaration, the prophet describes a gross form of idolatry so vividly that we may be sure it is from personal knowledge. The statues of the Roman, and the pictures of the Greek Church are authoritatively declared to be mere aids to devotion, and to be honoured only for the sake of persons they represent; but to very many of the peasants of Italy, or Spain, or Russia, the crucifix or the *ikon* is a real idol.

Ifugaos, a Malay people, Philippine archipelago, chiefly in the provinces of Nueva Vizcaya and Isabela, island of Luzon. Formerly their domain lay farther north; but towards the end of the 17th century they were driven by the Gaddanes to their present homes in the hills between the Cagayan and Magat rivers. The Ifugaos, who resemble the Japanese in appearance, are much given to head-hunting, decorating their dwellings with their victims' skulls, and inserting in the distended lobe of the ear a bamboo ring for every man slain. Some of their warriors killed in battle have been found with as many as thirty-two such rings. The captures are made by means of a lasso thrown round the neck of unguarded wayfarers, who are then beheaded with a saw. The Ifugaos are all pagans, at constant war among themselves and with all the surrounding populations.

Igarras (IGALA), a large Negro people of the Lower Niger basin, whose territory extends 100 miles along the left bank of the Niger from the Benue confluence southwards to the Ibo territory, and along the left bank of the Benue to about long. 8° E., where it is conterminous with the Michi domain. They are akin to the Igbiras (q.v.) of Nupé on the right bank of the Niger, and speak a dialect of the Akpotto language common to both peoples. Next to the Ibo this is the most widely-diffused idiom in the Lower Niger region, and has been carefully studied and reduced to written form by the Protestant missionaries. Several Christian stations have been founded amongst them, and since their acceptance of the British protectorate (1887) they have agreed to discontinue human sacrifices and all traffic in slaves.

Igbiras, a large and formerly powerful Negro people of the Lower Niger basin dominant in Nupé, that is, the region stretching along the right bank of the Niger from below the Benue confluence north-west to Borgu (lat. 10° N.) and thence southwards to Yorubaland. Here they had founded a powerful kingdom with capital Fanda (Panda), which was overthrown by the Fulahs about the middle of the present century. The Igbiras are now governed by a Fulah emir ("prince"), who is himself a vassal of the Fulah emperor of Gando, and since 1886 included in the British protectorate. The ruins of Fanda are still seen at a spot about 50 miles north-west of Lokoja at the Niger-Benue confluence. The Igbiras are a semi-civilised Negroid people, very industrious and great traders. Since the Fulah conquest many have become Mohammedans and a few Christians, but the bulk of the nation remains pagan, though all sanguinary rites have long been discontinued. The language is closely related to Igarra, and forms with it a branch of a primitive Negro tongue with which Nupé proper, Yoruba, Ewe of Dahomey, and Tshi of the Gold Coast are all fundamentally connected. (Bishop Crowther, *Journals*.)

Igen (I-YEN), the aborigines of the Liang-Shan mountains, Yunnan; but the term, meaning "strangers," is applied to and assumed by many hill tribes in west and south-west China who

object to the more usual name Man-tze, which means "untameable worms." (Gill, *Travels*, vol. i. p. 355.)

Ighadhanâren (IHADANÂREN), a noble Tuareg tribe, one of the most turbulent in the North Central Sahara, occupied almost exclusively with fighting and raiding. They are members of the Azjar confederacy, but are constantly shifting their quarters, occasionally encamping amongst the Ahaggars, whence they extend their marauding expeditions as far as the Azwâd district, north of Timbaktu. But their usual camping-ground is on the Admar plain between Tasili of the Azjars and the Anhaf range north and south. Although "nobles" they have no servile tribes under them, but are divided into three distinct groups or castes, Wi-Sattafenin, Wi-Temûlat, and Dergu. (H. Duveyrier, *Les Touareg du Nord*.)

Iglau, or JIHLAVA, a town of Moravia, Austria, is situated on the right bank of the river Iglawa, about 50 miles N.W. of Brunn, and is capital of the circle that bears its name. It has for seven centuries been an important military and commercial centre, consisting of the old fortified burgh with three more modern suburbs. The churches of St. James and St. Ignatius are ancient and handsome structures, and there are the usual public institutions of a provincial capital. Chief among the local industries are cigar-making, cloth- and linen-weaving, iron-working, and brewing, a considerable trade being also carried on in corn and timber. During the Thirty Years' War it was twice taken by the Swedes, and in 1805 the Bavarians under Wrede were defeated under its walls by the Archduke Ferdinand d'Este.

Ignatieff, GENERAL NICHOLAS PAULOVITCH, was born in 1832 and at the age of seventeen entered the Russian Imperial Guard. He served in the Baltic Provinces during the Crimean War, and was afterwards military attaché in London. In 1859 he was sent as ambassador to Peking, where he concluded a commercial treaty and obtained the cession to Russia of the province of Ussuri. In 1864 he took over the embassy at Constantinople, and soon gained considerable ascendancy over Abdul-Aziz. It was not until the conclusion of the Turco-Servian war in 1876 that his Pan-Slavism openly declared itself. The Porte declined to submit to his conditions, and he left his post in order to preach a new crusade to the European Powers. In the end Russia had to undertake the task single-handed, and in 1878 he was entrusted with the negotiation of the Treaty of San Stefano. Gortschakoff's consent to submit that document to the Berlin Conference stirred his indignation so deeply that he retired for a time from public affairs. On the accession of Tsar Alexander III. he was recalled, and appointed Minister of the Interior in succession to Count Loris Melikoff. His vigorous policy against both Nihilists and Jews proved ineffectual, and he was dismissed after a few months, though still retained on the council of the empire.

Ignatius, ST., surnamed THEOPHORUS, a martyr and Apostolical Father, was born in Syria early in

the first century A.D. St. John the Evangelist appointed him bishop of Antioch in 68, and there he exercised his functions until in 107 Trajan visited the city, and endeavoured to persuade him to apostatise. On his refusal he was sent to Rome, and exposed to wild beasts in the arena. He left seven genuine epistles, and over the authenticity of others ascribed to him controversy has raged fiercely.

Ignatius Loyola. [LOYOLA.]

Igneous Rocks (also known as *eruptive rocks*, and mostly, when classified as to texture, included among *massive crystalline rocks*) form, with aqueous and metamorphic rocks, the three main groups into which all rocks are classified with reference to mode of origin. The name, suggesting origin in fire, is unfortunate, but they have all originated in the heated interior of the earth, and have consolidated by cooling from a molten, or at least pasty, condition.

In this respect they may be subdivided into three series—plutonic rocks, lavas, and tuffs. *Plutonic* or *hypogene* rocks are those that have consolidated far below the surface, and consequently under great pressure and at a slow rate, thus becoming very perfectly crystalline. *Lavas* are rocks which, having been poured out by volcanic action, have cooled at or near the surface, and therefore comparatively rapidly and with imperfect crystallisation, being sometimes glassy, slaggy, or, as it is termed, *vitreous*. This group of volcanic rocks, however, passes by gradations into the plutonic series, some of the more compact, massive, and crystalline lavas that occur in thick sheets being formerly separated as an intermediate group known as *trap* or *trappean* rocks, from the Swedish *trappa*, a stair, from their step-like outcrops. *Tuffs* are fragmentary volcanic rocks, formed by the dust and scoria of volcanoes, fragments blown from molten lava by explosive action, cooled separately, generally with a texture vitreous rather than crystalline, and sometimes compacted into a cement-like sedimentary rock, such as the black volcanic mud now accumulating in the Bay of Naples.

Chemically, igneous rocks consist of silicate of alumina, with smaller proportions of silicates of magnesia, lime, potash, and soda, usually with some oxide of iron and phosphate of lime, and with or without an excess of free silica crystallising as quartz (q.v.). From this point of view we obtain the most satisfactory primary grouping of the massive members of the group (*i.e.* the plutonic rocks and lavas), based mainly upon the percentage of silica (formerly known as silicic acid) which they contain, into four sections, acid, intermediate, basic, and ultra-basic. *Acid* rocks contain more than 66 per cent. of silica, some of which occurs as quartz, and their specific gravity is about 2.5; the *intermediate* rocks range in silica percentage from 55 to 65, but are without quartz, and have a specific gravity of about 2.6; the *basic* rocks contain 46 to 55 per cent. of silica, with considerable percentages of magnesia, lime, and iron, are heavy, having a specific gravity of 2.7 to 3, and are readily fusible; and the *ultrabasic* rocks contain less than 46 per

cent. of silica, and have a specific gravity generally exceeding 3.

Mineralogically igneous rocks consist mainly of felspar (q.v.), orthoclase felspar with quartz being characteristic of the acid section, but only plagioclase occurring in the basic section, and no felspar at all, as a rule, in the ultra-basic. Hornblende (q.v.) is characteristic of the intermediate section, associated either with orthoclase or with plagioclase. Augite (q.v.) and olivine (q.v.), associated with the more basic felspars, such as labradorite, with magnetite, ilmenite, and often apatite, characterise the basic section; and olivine, pyroxenes, magnetite, and chromite, without felspar, characterise the ultra-basic. In some few cases felspar is replaced by nepheline, leucite, olivine, or serpentine.

The acid section includes the crystalline granites, eurites, felsites, and liparites, the latter being always volcanic, and the glasses obsidian, pitchstone, perlite, and pumice. The intermediate section comprises the plutonic syenites and diorites, and the volcanic trachytes, andesites, and phonolites. The basic section includes the basalts, diabases, and gabbros; and the ultrabasic, the peridotites, picrites, and serpentinites. Most of these rocks are separately described.

Ignis Fatuus (Lat. "foolish fire") is an appearance of a flickering light seen after sunset in churchyards and over marshes. Descriptions vary a great deal, and no satisfactory explanation of the phenomenon has yet been given. The light is generally of a blue-green or yellow colour; it may remain steadily in one spot; it may bound about and rise some feet into the air, or it may recede as the observer approaches it. Perhaps in some cases luminous insects or the phosphorescence of other animal or vegetable matter has produced the effect. Although marsh gas is inflammable, and is readily given off in marshy ground, it does not take fire at all readily, and is not likely to offer the best explanation. Phosphoretted hydrogen is possible; it is spontaneously inflammable, but its smell when burning is characteristic and could scarcely pass unnoticed. An inflammable phosphorescent vapour would explain many of the strange movements, but none is known excepting that of phosphorus itself, and this does not occur free. The folklore of the Jack-o-lantern, the Will-o'-the-wisp, etc., which are the popular names of the ignis fatuus, is very extensive and interesting.

Igorrotes (IGOLOTS), the largest and most powerful of all the semi-independent Malay peoples of Luzon (Philippine Islands), where they occupy the hilly districts in the provinces of Benguet, Lepante, Tiagan and Bontoc. Very few are now found in their original home, the Bengnet valley, since the sanguinary wars of 1820 and 1830, which resulted in the conquest of a great part of those fierce wild tribes. Type—very short muscular figures, 4 feet 8 inches high, clear olive-brown or yellowish complexion, thick black, lank, and lustreless hair, prominent cheek-bones, large black and slightly oblique eyes, which has been attributed to a strain of Chinese and even Japanese blood. The Igorrotes, who wear a kind of blue (white for

mourning) cotton or bast plaid wrapped twice round the body, live in wretched pile hovels, grouped in large villages. Formerly they were ferocious head-hunters, drinking the blood of their victims and celebrating the return of successful raiders with frightful orgies. The conquered and settled tribes are mostly nominal Roman Catholics, but the rest are all heathens whose religion is essentially a system of ancestry-worship. Spanish writers often apply the term *Igolot* in a general way to all the wild tribes in the hilly northern parts of Luzon; hence the vague meaning acquired by this word in ethnological works. (Fr. Blumentritt, *Ethnographie der Philippinen*; Semper; Schneidnagel, *Districts de Benguet*, 1870.)

Iguana, a genus of tree-lizards, with five species from the Antilles and South America, the type of a family (*Iguanidae*) with fifty-six genera, from the Neotropical region. They feed on leaves, fruit, and, to some extent, on insects. In the type-genus there is a pouch under the throat, and a row



IGUANA.

of spines extending from the neck to the tip of the tail. The common Iguana is green in colour and from 3 feet to 5 feet long; its eggs and flesh are used for food. It enters the water readily, and swims with ease, using the long tail as a propeller. To this family belong *Amblyrhynchus* (the marine lizard described by Darwin), *Phrynosoma* (the Horned Toads), and *Basiliscus* (the Basilisks).

Iguanodon, a genus of Dinosauria (q.v.) belonging to the subdivision Ornithopoda (bird-footed), which have been found in the Upper Jurassic and Lower Cretaceous rocks of south-east England and Belgium. They rivalled the elephant in size, being upwards of 30 feet long and having a thigh-bone as much as 5 feet in length. Their front limbs were much smaller than the hind ones, and these latter show marked affinities to those of the ostrich-like birds. Their feet were three-toed, and, judging from their footprints, they seem to have walked almost entirely on their hind legs. There was a long and massive tail, adapting the

animal for sitting up, as do those of the kangaroo, the megatherium (q.v.), or the woodpeckers. The teeth resemble those of the iguana of the present day, being in distinct sockets, curved, leaf-shaped, and serrated along the margin; but they are ground down above like the grinders of mammals, and were succeeded by others from below. The front of the jaws was toothless and beak-like. *Iguanodon* was very imperfectly known until the recent discovery of twenty-four extremely perfect specimens at Bernissart in Belgium, in detached pockets of Wealden strata. Several of these are now mounted in the Brussels Museum. They were undoubtedly purely herbivorous animals.

Ikongo, a people of south-east Madagascar, south of and akin to the Tanalas and, like them, nominally subject to the Hovas of the province of Betsileo. But they have never been conquered, and during the wars of King Radama, in the first quarter of the present century, they successfully sustained two sieges—one of 18 the other of 12 months—in their impregnable stronghold perched on an isolated eminence in the heart of their territory. The Ikongos, though pagans, were friendly to the missionary Shaw, who visited them in 1874-75.

Ile de France. [MAURITIUS.]

Ile de France, a name given to that district of France which is enclosed between the rivers Marne, Seine, Oise, Aisne, and Ourcq. The ancient province which bore the name comprised large tracts beyond this circumscribed area. Except at the close of the Carolingian dynasty, the Ile de France has usually been a royal domain. The province is now divided between the departments of Seine, Seine-et-Oise, Seine-et-Marne, Oise, Aisne, Loiret, and Nièvre. It is interesting to historians as the cradle of the Capetian dynasty, and to some extent of the French name, and because Paris was its capital.

Ilfracombe, a market-town and port in North Devon, 11 miles N.W. of Barnstaple, and at the mouth of the Bristol Channel. Some export trade is done in ore, corn, and other products, and fishing provides a livelihood for many of the inhabitants. Of late years, however, Ilfracombe has been better known as a fashionable watering-place. The parish church dates from the 12th century. The natural harbour has been improved by a pier and a light-house, and there is daily steam communication in the summer with Bristol and other ports, access by land being afforded by the London and South-Western and Great Western Railways.

Iliyats (*il* or *eil*, "tribe"), a collective term applied in Persia to all nomad and pastoral peoples irrespective of their nationality, and in contradistinction to the settled agricultural and urban populations. Hence there are *Aryan Iliyats* (Kurds, Luri, Baluches), *Turki Iliyats* (Turkomans), and *Semitic Iliyats* (Arabs). But all alike are distinguished by their warlike spirit, conservative habits, and national, or at least tribal, sentiment. Since the decay of the old Iranian (Persian) elements, the Iliyats form the backbone of the State, and the chief source whence the government

draws its levies. For over 1,000 years they have dwelt in the land, keeping mainly aloof from the sedentary Persian inhabitants, preserving their nomad usages, tribal genealogies, and national speech, although most of them now understand the Persian language. The Iliyats are, in fact, the dominant people, the reigning dynasty being members of the Kajar (Turkoman) tribe. In recent years some have abandoned the pastoral life and now reside in the large towns or the agricultural villages. Hence the two-fold division—*Shahr-nishin* "town dwellers," and *Sahrâ-nishin*, "country dwellers."

Ilkeston, a market-town of Derbyshire, on the Midland Railway, 10 miles N.E. of Derby. It stands on the crest of a hill commanding a fine view over the Erewash valley, and became a centre of local trade in the middle of the 18th century. Part of the parish church (Norman and Early English) dates from the reign of Stephen. Hosiery, especially of silk, and stoneware are the chief manufactures. Coal and iron are worked in the neighbourhood. Of late years many visitors have been attracted by the alkaline mineral springs, the water of which is beneficial to the gouty and rheumatic.

Ille-et-Vilaine, a department in the N.W. of France, forming part of the ancient province of Brittany. It is bounded N. by the sea and the department of La Manche, E. by Mayenne, W. by Morbihan and Côtes du Nord, and S. by Loire-Inférieure. It has an area of 2,597 square miles, mostly level with occasional marshy patches. Besides the rivers from which it takes its name, there are the Airon, Rance, Meu and Seiche, all more or less navigable. St. Malo is an important seaport and Rennes is the capital. The soil is not very fertile, but wheat and other cereals, hemp and flax, potatoes, and apples and pears are grown with success, the cider of the country being highly esteemed. Cattle and horses thrive well, but sheep are not abundant. Iron, silver-lead, zinc, granite, slate, and flints are a source of considerable wealth. Leather, sail-cloth, salt, glass, paper, butter, and cheese constitute the principal industrial products.

Illegitimacy. [BASTARD.]

Illinois. 1. One of the United States of North America, situated between Wisconsin N., Indiana and Lake Michigan E., Kentucky S., and Missouri and Iowa W. Originally a French colony, it was ceded to Great Britain in 1765 and remained a part of the North-West Territory from 1787 to 1818, when it was admitted to the Union. It has an area of 55,414 square miles, the greater part consisting of flat or rolling prairies, but in the south and along the rivers, of which the Wabash, Ohio, and Mississippi are the chief, luxuriant forests abound. The soil is generally rich, and almost all products of a temperate climate grow readily. Wheat and maize are yielded in vast quantities by the treeless plains where no serious failure of the crop is ever known. The forests provide food for countless herds of swine. Coal is found throughout the state, and iron and copper being easily imported from Lake Superior, a great manufacturing industry

has been developed during the last twenty-five years. Lead exists in apparently inexhaustible quantities; and the Lemont marble, a fine building-stone, furnishes material for the adornment of the handsome cities, of which Chicago is the greatest, though Springfield is the seat of the State government. The railway system is more fully developed in Illinois than in any other state, for not only do all the great trunk lines connecting the Atlantic with the Pacific, and the Mississippi Valley with Canada, radiate from this point, but scarcely a single settlement is so far as 10 miles distant from a station. Moreover, inland navigation by means of the many rivers, the Illinois and Michigan canal, and other channels, enables the producer to bring his goods into the market at a very cheap rate. The educational and charitable organisations are liberally maintained, and 75 per cent. of the population between the ages of six and twenty-one are registered as attending schools.

2. An old aboriginal people of North America, mentioned by the early French explorers, but now extinct, or surviving only in the name of the river and of the state where they roamed. At the time when Cavelier de la Salle was exploring the Mississippi basin (1670-82) they occupied both banks of the Illinois and apparently also the northern shores of Lake Michigan, which La Salle always speaks of as the *Lac des Illinois*. This term is a French form of *Iliniwok*, which means "men," "people," in several Algonquian languages, a clear indication that they were a branch of that widespread family. Comp. the *Ininiwok* of the Salteux Indians and the *Iyiniwok* of the Kree people.

Illiterates, persons unable to read or write, or able to read but not to write. Various methods have been adopted for ascertaining the proportion of illiterates in a country to the whole population with the view of gauging the progress of education. In some countries an attempt has been made to take a general census; the result given ranged from 22.15 per cent. in the United States to 79.07 per cent. in Portugal. At the general election of 1886, 2.69 per cent. of the whole number of electors in Great Britain were illiterates. In the same year 10.55 per cent. of the persons married in England and Wales were unable to sign their names in the register; the percentage in Scotland was 6.46, in Ireland 24.35, whilst among colonies and foreign countries Italy headed the list (1887) with 52.58 and Victoria appeared at the bottom with 1.99. In some countries, where conscription extends to all classes, the proportion of recruits who can neither read nor write is accepted as equivalent to that of the whole male population. In estimating these various results, it must be remembered that as they are obtained by very different means, the data for forming a comparison are not very satisfactory.

Illuminati, "the Enlightened Ones" (1) a name adopted by several mystical sects who maintained that they had received a special revelation or possessed a more intimate knowledge of holy things than was granted to the mass of mankind. The most important were the *Alombrados*, who arose in Spain early in the 16th century, and were finally

suppressed by the Inquisition, and the *Guérinets*, a French sect founded by Antony Bucknet about a century later. (2) A semi-religious, semi-political association, founded in 1776 by Adam Weishaupt (1748-1830), professor of canon law in the university of Ingolstadt. Its main object was to counteract the influence of the Jesuits and promote freedom of thought in religious matters, but it also endeavoured to extend republican principles. It was divided into three classes: the novices or Minervals, the Freemasons or Scotch Knights, and the pupils in the small and great mysteries. After the adhesion of Baron von Knigge, in 1780, the number of the Illuminati rapidly increased, but in 1784 Weishaupt and Von Knigge quarrelled, and in 1785 a persecution began which led in a few years to the total collapse of the order.

Illumination, the art of adorning MSS. and books with paintings and ornamental letters and designs. The paintings in mediæval MSS. were called miniatures from the frequent use of a red pigment named *minium*: they were necessarily very small, a circumstance which gave rise to the modern meaning of the word. Certain Egyptian papyri are extant, in which directions concerning ritual are written in red ink to render them more conspicuous (a method also employed in mediæval liturgies; hence the term *rubric*), and even coloured pictures are sometimes introduced. With this exception there are no illuminated MSS. older than the 4th century A.D. The most ancient are the *Dioscorides* at Vienna, and the *Virgil* in the Vatican; in both the ornament consists of rectangular pictures. The *Codex Argenteus* (c. 360), now at Upsala, containing Ulfilas's translation of the Bible into Mæso-Gothic, exhibits a different style of illuminating; here the letters are of gold and silver, and the vellum on which they are written is stained with a red-purple dye—an art the secret of which was afterwards lost. One of the most conspicuous features of the *Byzantine* style is the abundant use of gold, especially in backgrounds. Byzantine influence can be more or less clearly discerned in all subsequent styles up to the 11th century. Even the *Keltic* style which grew up in the Christian monasteries of Ireland, reaching its zenith in the beautiful *Book of Kells* (probably a work of the 9th century), is believed to have been of Byzantine origin. The Keltic MSS., however, display a skill in the minutiae of draughtsmanship which is unrivalled in any other style; their most remarkable characteristic is the extraordinary intricacy of the designs, consisting usually of spirals, ribbon-patterns, and interlaced forms of attenuated animals and birds. The Keltic style was carried by the Irish missionaries to the Continent, where it united with Roman and Byzantine elements in the formation of the *Carlovingian* style, which grew up in France and Germany under the encouragement of Charlemagne. The *Harleian Codex Aureus* in the British Museum is a magnificent example of the Carlovingian period. Of the *English* style, which corresponded to the Carlovingian abroad, the finest example is the benedictional of Ethelwold, Bishop of Winchester (963-84), now at Chatsworth. The art declined owing to

the excessive care bestowed on the ornamentation of detail, whilst the writing itself was neglected. In themselves, however, the paintings in MSS. of the 14th and 15th centuries surpass those of any preceding age. The most beautiful example of this period is the *Bedford Hours* (1423) in the British Museum. During the Middle Ages the illumination of MSS. was carried on in the scriptorium attached to every monastery. It was afterwards practised by laymen, but gradually died out after the invention of printing, lingering on in France as late as the reign of Louis XIV.

Illustration of Books. Before the invention of printing the illuminations (q.v.) in MSS. served the two-fold purpose of elucidating and ornamenting the text. The earliest printed books in which the text was illustrated by a series of wood-engravings are said to have been the *Tables* of Ulrich Böhner (Bamberg, 1461) and a work entitled *Meditationes* (Rome, 1467). Metal-engravings were first employed in *Il Monte Santo di Dio* (Florence, 1477). Illustrations in chiaroscuro, in which various shades of the same colour are produced by means of different wood-blocks, occur frequently in books published early in the 16th century, and are often executed with very great skill. In the early years of the 19th century lithography (q.v.) to a great extent took the place of steel-engraving in the illustration of books, but during the first half of this century steel-engraving and etching received a fresh stimulus; and many beautiful illustrations for books of an ornamental kind were produced by Turner, Stothard, and other great artists. This progress was checked through the introduction of various processes suggested by the invention of photography, and it now seems probable that eventually steel-engraving will be entirely superseded by photogravure (q.v.). Wood-engraving, on the other hand, has held its ground since its re-introduction by Bewick, who was followed by Sir John Gilbert, Birket Foster, Cruikshank, H. K. Browne, Leech, Tenniel, and others. Various processes have, however, been invented, in which in place of wood-engraving it is sought to introduce the use of relief blocks. These fall into two classes, according as the drawings reproduced are line drawings in pen-and-ink or black-and-white on the one hand, or half-tone photographs or wash drawings, on the other. The first successful attempt to produce relief blocks from photographs and wash drawings was made by Meisenbach, of Munich, in 1882. Various mechanical processes are also employed for the production of relief blocks; amongst these Dawson's typo-etching process is perhaps the best known. The chief recommendation of these chemical and mechanical processes as compared with wood-engraving is, that usually they can be executed at a lower price, but this is not by any means invariably the case. [ENGRAVING, PHOTOGRAPHY.]

Illyria (Gk. *Illyris*, Lat. *Illyricum*), the name of a somewhat vaguely-defined country on the east shore of the Adriatic, where, according to legend, Cadmus of Thebes settled and became father of Illyrius, and so of the race or nation. Five Roman emperors had in their veins Illyrian blood.

Gradually Illyricum grew to be one of the four divisions of the empire, embracing a large share of the Balkan peninsula. On the split of the empire, it was partitioned into Illyria Romana and Illyria Græca, and later on had to bear the brunt of Gothic and Slavonic invasion until the Huns amalgamated with the original population, and the coast as far as Dyrrachium was given up in the 7th century to the Slavs, who still occupy it. The Albanians, a branch of the old Illyrian stock, pushed farther south, but Illyria as a geographical appellation ceased to exist, Bosnia, Croatia, Servia, Dalmatia, and Rascia taking its place. Narenta and Ragusa for a time enjoyed great commercial prosperity, and in 1809 a kingdom of Illyria was revived by the Treaty of Vienna, but vanished from the map after forty years.

Ilocanos, a Malay people of Luzon (Philippine archipelago), where they occupy several districts in the provinces of Pangasinan, and the two Ilocos (North and South), named from them. They have also repopulated much of the Benguet valley after the extermination of its original Igorrot inhabitants during the wars of 1820 and 1830. They are a restless, enterprising people, who have sent out colonies in all directions, and founded settlements even in the Babayanes and Batanes archipelagoes. In this respect they are favourably distinguished from the Tagalas and other civilised Indians, who are remarkable chiefly for their extreme apathy and indolence. They live mainly on rice and fish, although cultivating maize, coffee, the grape, the cocoanut palm, and sugar, besides cotton, indigo, cacao, and the olive. They also own an excellent breed of horses, as well as herds of cattle, swine, and the buffalo, which they barter with the surrounding hill tribes. Since their reduction by Salcedo in the second half of the 16th century, all have become nominal Christians. Socially they form two distinct classes, the nobles and the *cachianes*, or serfs, who were formerly treated with great cruelty, but who have acquired a measure of civil rights since the revolts of 1762 and 1811. (Blumentritt.)

Ilongotes (ILUNGUT), an independent Malay people, who occupy a large territory in the hilly northern districts of Luzon, Philippine archipelago. They are amongst the most savage tribes of this region, waging constant warfare both with the settled Christian communities and with the surrounding Negrito wild tribes. The chief object of their expeditions is the capture of human heads, with which they decorate their houses, and the possession of which gives rise to everlasting feuds amongst themselves, the different villages being constantly engaged either in defending their own or in raiding the trophies of their neighbours. A few were reduced in the province of Nueva Vizcaya about the middle of the century; but the great bulk of the Ilongotes are still pagans, mainly ancestry worshippers. (Blumentritt.)

Ilori (ILORIN or ALORI), a large town in Africa, situated about 150 miles N.E. from the Bight of Benin. The inhabitants are chiefly Yorubans, and Mohammedanism predominates. A large trade is done in the bazaars, to which goods are brought

not merely from the interior, but from the Mediterranean and Guinea coasts. It has been visited by Booth, Lander, and Burton, from whom we gather that the walls have a circuit of twelve miles.

Ilyanthidæ, a family of sea anemones, of which the type-genus is *Ilyanthus*: it differs from *Actinia*, the common sea anemone, by having a pointed, not basal end, and by being free-swimming.

Image, in various branches of physics, signifies strictly an objective deception of the sense of sight or of hearing. The most familiar is the reflection of objects in a mirror. Here there is an appearance of reality behind a plane sheet of burnished metal, caused by regular reflection of light coming from the actual objects in front. There are no waves of light actually proceeding from behind the mirror, and such images are termed *virtual*. Another instance is that of the formation of a small image of the sun, by proper focussing of a magnifying-glass, on a sheet of paper. Here the waves of light actually proceed from the image, which is therefore termed *real*. Echoes supply examples of both real and virtual images produced by reflection of sound waves. Analogous effects are obtainable with electric and other oscillations.

Imaginary Quantities, in algebra, signify numbers that have not yet been interpreted. The most familiar are the two square roots, positive and negative of -1 . They are symbolised $\pm\sqrt{-1}$, or $\pm i$, and by ordinary definition of square root they mean such numbers that when squared will give -1 . Now all ordinary numbers, both positive and negative, will give positive results when squared, and an entirely new region of numbers is entered when the reality of $\pm i$ is entertained. To be consistent in theory we are certain to come upon these new units, and they cannot be neglected. Moreover, the proper use of imaginary quantities often leads to real results that are not at all imaginary and that can readily be tested. It must be understood that many such quantities might be used in mathematics, if we knew how to manipulate and interpret the results obtained. Till the present century mathematicians had confined their investigations in number to the units ± 1 and $\pm i$. Sir William Hamilton in his system of quaternions introduced others, his set of four being 1, i , j , and k , to the last three of which special relations were assigned, in the same way that the old i^2 was defined as being identical with -1 . [QUATERNIONS, VECTOR CALCULUS.]

Imago, the name of the adult or winged condition of the butterfly after it has emerged from the chrysalis.

Imanghasaten, a Tuareg people of the north central Sahara, members of the Azjar confederacy, although traditionally descended from the Megârha Arabs of the Wady Shiâti in Fezzan. At present they are entirely assimilated in dress, speech, and customs to the other Azjar Tuaregs, amongst whom they have their camping grounds. Since the memorable expedition of Denham, Clapperton, and Oudney (1822), the Imanghasaten have always been the friends and protectors of English explorers,

while the neighbouring Orâghen have taken the French under their protection. But for this friendly disposition of some of the Tuareg tribes no Europeans could have ever penetrated from the Mediterranean seaboard across the Sahara to Sûdan. (H. Duveyrier, *Les Touareg du Nord*.)

Imazighen (singular, AMÂZIGH), the proper collective name of all the Mauritanian Berbers, meaning either "Descendants of Mazigh," a legendary ancestor of the Berber race, or more probably the "Free" or "Noble." This term, which is of vast antiquity, being already known under various forms (Mazyes, Machmes, Mazices, etc.) to Herodotus and other early writers, is merely a dialectic variant of *Imohagh*, *Imoshagh*, the proper collective name of the Tuaregs or Saharan Berbers. In Morocco it answers to the *Shelûh* or *Shlûh* of the Arabs, although this term is now restricted to the tribes of the central districts of the Great Atlas, those of the north being more commonly known as Kabyles, like the kindred peoples of North Algeria.

Imbros (mod. *Imvro*), an island in the Ægean Sea, about fourteen miles from the entrance to the Dardanelles, between Samothraki and Lemnos. It has an area of 105 square miles, most of which is covered by bare and rugged mountains. There is only one river of importance, and lack of water is a bar to agriculture. Kastro, the capital, is a mere village on the coast, Theodoro, Gliki, and Panagia being still poorer communities. The island has formed part of Asiatic Turkey since the 15th century, and is the seat of a Greek Metropolitan, the Exarch of the Ægean.

Imeritians (IMERIANS), the inhabitants of the Caucasian province of Imeritia, which extends west of the Suram range as far as the Tzchemis-Tzchali river. *Imerian* is the correct form, meaning "People of the other side," in reference to the mountains separating them from the bulk of the Georgian race, of which they are a western branch. They are the highlanders, as opposed to the Mingrelian lowlanders of the Rion basin. All are comprised in the Russian administrative province of Kutais since 1810, when Solomon II., last ruler of the old kingdom of Imeria, was deposed by the Russians. (Carlo Serena, *Excursions dans le Caucase*, in *Tour du Monde*, 40-43.)

Immaculate Conception, a doctrine of the Roman Catholic Church to the effect that the Blessed Virgin "from the first moment of her conception in the womb of her mother was preserved free from all taint of original sin." The doctrine can be traced back in a vague form to an early period, but it was never distinctly stated before the 12th century. In 1140 St. Bernard of Clairvaux addressed a remonstrance to the canons of Lyons cathedral because they had introduced a festival in celebration of the doctrine without episcopal sanction. Early in the 14th century the doctrine was upheld by the Franciscan schoolman, Duns Scotus, and its truth and falsehood became a matter of keen controversy between his order and their Dominican opponents. The University of Paris generally supported the view of the Franciscans,

and in 1439 the doctrine was recommended as a "pious opinion" by the Council of Basel. In the same council the 8th Dec. was set apart for the celebration of the "Feast of the Immaculate Conception." The matter continued to be more or less warmly debated during the following centuries, but in 1854 it was settled by the publication of the Papal Bull "Ineffabilis Deus," which made the dogma an article of the Catholic faith.

Immermann, KARL LEBERECHT, was born at Magdeburg in 1796, and was a law-student at Halle when "the Hundred Days" brought a renewal of war. He joined the Prussian ranks, fought at Ligny and Waterloo, and on his return received a judicial post at Düsseldorf. Under the influence of Countess Ahlefeldt he devoted his leisure to literature and to the vain attempt to elevate the national drama. His tragedies, though rugged, show power of characterisation, and his comedies are by no means devoid of humour. More popular were his romances, especially *Die Epigonen*, and his miscellaneous writings, which include a translation of *Iranhoe*. His platonic alliance came to an end in 1839, when he married a granddaughter of the Chancellor Niemeyer, but he died in the following year.

Immigration and Emigration. An emigrant is one who leaves his native soil to settle in a colony or foreign land; an immigrant is a new-comer, whether alien or connected by blood with the people among whom he arrives. Thus he who is an emigrant at one end of his journey becomes an immigrant at the other, and although the two movements are perfectly distinct as long as attention is confined to a single country, their mutual relations are so close that the one can seldom be fully understood without some reference to the other. The range of inquiry opened up by the history of emigration and immigration from the beginning of history to the present time is practically boundless, and all that will be done here is to give some account of the state of the two movements in Great Britain at the present time. The increase which has taken place in emigration within eighty years is shown by the fact that in 1815 only 2,081 emigrants left the country, whereas in 1891 the number was 334,543. Of this total 33,752 were bound for British North America, 252,016 for the United States, and 19,957 for Australasia. 218,507 were natives of Great Britain, 139,979 being English, 20,653 Scotch, and 57,484 Irish. State-aided emigration is now much advocated, though it has been generally abandoned in the Australian colonies as lowering the rate of wages. [COLONY.] Two schemes were devised in 1892. The first was the work of the late Hon. John Robson, Premier of British Columbia, who submitted to the Imperial Parliament a plan for transporting some 1,200 families of Scotch crofters to Vancouver Island, where facilities would be afforded them for engaging in the fishing trade; for this purpose the British Columbian Government was to receive from Parliament a loan of £150,000. In September, 1892, it was announced by the Government of Western Australia that, in accordance with the "homestead free grant" system, they were willing to grant

plots of land, not exceeding 160 acres each, besides advancing £150 to settlers from the public money. It is to be remarked that in the Australian and other colonies there is more opening for agriculturists and farm labourers than for professional men and artisans, the colonies being able to supply from their own inhabitants as many of the latter as they require. The increase in the number of emigrants from the United Kingdom of British origin in 1891 was 391, whereas that in the total number was 18,563. This fact confirms the view that the greater number of the pauper aliens, whose arrival in the country within the last few years has created so much panic, had no intention of settling here, but were on their way to America. They are mostly Russian and Roumanian Jews, who have been driven to seek a refuge abroad owing to the hard conditions under which they are compelled to live by anti-Semitic legislation. They generally embark at the ports of North Germany, especially Hamburg and Bremen, and, when they arrive in this country, they are almost always in a state of complete destitution. The severe restrictions recently imposed by the United States Government on immigration will certainly cause a considerable diminution in the number of those who find a home beyond the Atlantic. This may cause increased immigration into England, although, perhaps owing to the outbreak of cholera at Hamburg and elsewhere, which checked the movement for a time, no very serious "invasion" has hitherto taken place. In the preceding account it has been assumed that the immigration is *per se* an evil; but this is denied by some who are well qualified to form a sound judgment on its practical results. These authorities contend that, far from driving down wages to starvation point, and lowering the quality of work in the cheap cabinet-making, boot-finisher and other trades, the strangers have absolutely created some new industries—that the cheap tailoring trade *e.g.* as carried on by them did not exist before their arrival. It is also asserted that the descriptions of their colonies in East London and elsewhere as centres of physical and moral contamination are very much exaggerated.

Immortality. Although a belief in a future life of some kind is found amongst even the most savage races, and may almost be said to belong to the consciousness of humanity, the notion that the soul is immortal is a refined conception which does not make its appearance till a comparatively late stage in the progress of civilisation. It is doubtful how far it was present to the mind of the ancient Jews. Some critics maintain that no distinct notion of an eternal life can be traced farther back than the Babylonish captivity; whilst Balaam's prayer (Numbers xxiii. 10) and various passages in the Psalms of David, as well as the whole tenor of their hopes and aspirations, are brought forward in support of the opposite opinion. It is also held that our Lord's words in Matthew xxii. 29–33 show that there had been a revelation of the immortality of the soul even in the days of the Pentateuch. In the ancient religion of Egypt the immortality of the soul was supposed to depend on the preservation

of the body, and for this reason corpses were embalmed and entombed with great care. The realm of Ormuzd seems in many respects to have occupied in the ancient religion of Persia the same position which in that of Egypt belonged to the region where the just dwell for ever with the god of light. In Greece the belief in the immortality of the soul was the outcome of philosophic speculation. It was firmly held by the Platonic Socrates, who in the *Phædo* expresses his conviction in the most beautiful and glowing language. The Platonic doctrines became known to the Hellenistic Jews of Alexandria, and their influence has been traced in Ecclesiasticus, Wisdom, and other books of the Apocrypha. But in Greek philosophy the freedom of the soul from the limitations of matter is presented from an intellectual rather than a religious point of view, and it was only with the Christian revelation that it became recognised as the crowning-point in the moral scheme of the universe.

Immortelle. [EVERLASTING FLOWERS.]

Imohagh, collective name of the Tuaregs of the north central Sahara, comprising the eastern Azjars and the western Ahaggars, who were formerly united under the rule of the Imanân Sultans, but who, since the middle of the 17th century, have been constituted in two separate and independent confederacies. *Imohagh* is radically the same word as *Imoshagh* (q.v.). (J. Richardson, *A Mission to Central Africa*, 1855; F. Bernard, *Quatre Mois dans le Sahara*, 1881.)

Imoshagh (singular, AMOSHAGH), the "Free" or "Noble," collective name of the south-western Tuaregs, often applied in a general way to all the Saharan Berbers. [TUAREGS.] The Imoshagh, who are the Limtûna (Lamtûna) of mediæval Arab writers, form four distinct groups of independent confederate tribes, who are carefully to be distinguished from the *Imghad* (plural of *Amghi*), that is, the degraded or mixed Berbers of the desert, mostly living in a state of servitude to the Nobles. The four great historical groups are:—(1) The *Awelimmiden* proper, with twenty-two main divisions, besides forty servile and five religious tribes (Marabouts), jointly occupying most of the south-west Sahara, as far south as Timbuktû and the great northern bend of the Niger. (2) The *Awelimmiden-Wân-Bodhal*, called also *Dinnik*, greatly reduced, and now mainly confined to the district between the Niger and Asben (Air), where they form a petty independent state in alliance with the Kel-Gueres. (3) *Tademekket*, also reduced and driven by the Awelimmiden to the districts of Azwâd north of the Niger and to the tract within the Niger bend as far south as the Hombori Hills. The latter, collectively called Irighenaten ("Mixed"), have quite lost caste, many having contracted alliances with the Fulahs and Negroid Songhays, whose speech they have even in some cases adopted. To this group are attached four religious and eight servile tribes. (4) The *Igu-elâd*, a religious group dependent for their defence on the Tademekkets, and settled chiefly in Tagânet between Azwâd and Timbuktû north and south. The

Imoshagh, of whom there are altogether at least a hundred minor divisions, are all pastoral, raising large herds of camels, cattle, and horses. The warriors fight on horseback with lance, sword, and shields, and generally levy blackmail on all trading caravans passing through their territory. All wear the lintham or veil, concealing a great part of the face, originally as a protection against the sands of the desert, but now regarded as a sacred emblem never to be laid aside, even at night. (Barth, *Travels*, vols. iv. and v. *passim*).

Impact, in dynamics, signifies a sudden interchange of the amount of motion of two bodies which meet. One of the bodies may be at rest, as when a hammer strikes a chisel. In this case the momentum of the hammer-head seems to be entirely lost, but actually it is transmitted through the chisel to the bodies with which the chisel is in contact. Or the two colliding bodies may both be in motion and out of contact with others. In this case the fact that the total momentum is unchanged by impact may be much more readily proved experimentally. It must be remembered that the momentum of a body is measured by the product of its mass and its velocity, and that the momentum becomes of opposite sign algebraically when the direction of motion is reversed. Whether bodies are elastic or inelastic, *i.e.* whether they cling together after impact and so move as one, or whether they are separated by the internal forces of restitution that tend to make the distorted bodies recover their original shape—the same law holds good that the momentum of the whole system is unaltered by such an action. This may be inferred from Newton's Third Law of Motion. [DYNAMICS.] But the degree of elasticity possessed by the colliding system will determine their relative speeds after impact, when the bodies are not inelastic, and will settle the distribution of momentum. The relative speed after impact is always less than before; kinetic energy is, in fact, lost as such and converted into heat, for the bodies are always warmer after such an interchange of momenta. The fraction of the original value, by which the relative speed is reduced, is called the *coefficient of restitution*, and is a measure of the mutual elasticities of the substances.

Impeachment, a complaint or accusation against anyone for a great public offence, especially against a Minister of the Crown for malversation or treason. The House of Commons first finds the crime and then, as prosecutors, support their charge before the House of Lords, who try the question and adjudicate upon it. The charge is contained in Articles of Impeachment, to which the accused makes answers. The Commons appoint managers to conduct the proceedings on their behalf. The last memorable cases were those of Warren Hastings in 1788 and Lord Melville in 1805.

Imperforata, a group of the Foraminifera including all those with imperforate shells. It is now recognised that this character does not possess the value once assigned to it, and the group has been abandoned. [FORAMINIFERA.]

Imperial Green, also known as *emerald green*, consists of the double arsenite and acetate of copper. It has a fine green colour, and is a very permanent pigment, being unaffected by exposure to the atmosphere, but possesses the disadvantage of being of a very poisonous nature.

Imperialism is a term which may be used with a great variety of meanings, according to the circumstances under which it is applied. As used of modern Germany, it denotes the union of several distinct States, under a single ruler, who forms, as it were, a focus for the national feeling, and is able to give effect by his policy to the national aspirations. It was probably partly with the view of fostering a feeling of this kind, as well as of overawing the Indian population, that Lord Beaconsfield had the Queen proclaimed Empress of India. A similar notion underlies the aims and is expressed in the title of the "Imperial Federation League" and the "Imperial Institute"—viz. that England should remain the centre and rallying-point of the various branches of the Anglo-Saxon race, which, however widely scattered, retain the ties of a common race and language, political and social institutions, etc.

Imperial, Prince. [NAPOLEON.]

Impey, SIR ELIJAH, KNIGHT, was born at Hammersmith in 1732, and educated at Westminster and Cambridge, where he took high honours. In 1774 he was sent out to Bengal as first Chief Justice under the new Regulating Act, which imperfectly defined his jurisdiction. On his arrival the quarrel between Warren Hastings and Nuncomar had reached its culminating point, and the latter was brought to trial before Impey on a charge of forgery, and was convicted and hanged. Sir P. Francis accused the judge of unwarrantably extending his jurisdiction and of great harshness and injustice towards the prisoner. These aspersions were confirmed by the decision of Impey in favour of Hastings in the dispute as to his resignation, and by the unjustifiable way in which he mixed himself up in the affairs of Chait Singh. He was recalled in 1786, and defended himself at the bar of the House of Commons with such effect that the motion for his impeachment was rejected. In 1789 he resigned and, entering Parliament, sat for New Romney until 1796, but took no part in public affairs. He died at Newick, in Sussex, in 1809. Sir J. F. Stephen has recently vindicated his memory from Macaulay's attacks.

Impeyan Pheasant (*Lophophorus Impeyanus*), sometimes known by its native name, Monaul, from the Himalayas and Assam. The dark plumage of the male has a brilliant metallic gloss of varying hues, and he has a peacock-like crest. The popular and specific names refer to the fact that Lady Impey tried, unsuccessfully, to domesticate the bird in England. It has, however, bred in confinement.

Impressionism, a school of art which has grown into importance since the exhibition of the works of Manet and his disciples held in Paris in 1867. The whole theory and practice of the Impressionists are based on a single principle—viz.

that the artist should aim merely at producing a faithful record of the *impression* made on his own mind by the scene or object he depicts. This he will fail to do if he allows himself to be guided by the traditions of previous schools, or if his rendering of sensuous effects is dominated by some ulterior purpose of a moral, imaginative, or emotional character. There is no reason even why, in his choice of subjects, he should discriminate between the beautiful and the ugly, since this is a conventional and arbitrary distinction for which there is no warrant in Nature herself. From the preceding account it will be seen that Impressionism occupies much the same place in the history of modern art that Realism does in that of literature. Its chief exponent in England is Mr. J. M. Whistler, but it is now represented also by a more advanced group, the "London Impressionists," who held an exhibition of their works at the Goupil Gallery in London in 1889. Several of Monet's works were also exhibited at the Goupil Gallery in the same year.

Impressment, the legalised compulsion of a man to serve in the Royal Navy. The practice of impressment is of very ancient date in England, and though it is naturally odious, and has for many years been disused, it may in war-time be again revived. It seems to have been first formally legalised by an Act of 2 and 3 Philip and Mary.

Imprisonment. By the Debtors' Act 1869 imprisonment for "making default in payment of a sum of money" has been abolished except in certain specified cases, of which the more important are—default in payment of a penalty, not in respect of contract, default in payment of sums recoverable before a Justice of the Peace, and default by trustees or solicitors after order to pay; but in such cases the duration of the imprisonment is not to exceed one year. The above Act, however, gives any court a power of committal on default of payment when the party has the means of paying, and if the court be an inferior one when the debt does not exceed £50, but no such committal is to operate as a satisfaction or extinguishment of the debt.

Impropriation, the act of employing the revenues of a church living for a layman's use, and it exists where a rectory or tithes are held by a lay person termed the impropiator. In the case of a rectory the impropiator or lay rector is bound to provide for the cure of souls by appointing either a vicar or a perpetual curate for the purpose.

Improvisatori and **Improvisatrices**, a class of Italian poets and poetesses who possess the gift of immediately composing verses on any subject proposed, often singing and playing on the lute or some other instrument at the same time. The art is said to have been invented by Petrarch, and the Italians often amuse themselves in this manner at the present day.

Inamis (ENIMAS), South American aborigines, a branch of the Guaycuras, whose territory lies between the Paraguay and the Pilcomayo rivers east and west. They are the *Lingoas* of the Portuguese, and the *Lenguas* of the Spaniards, these words meaning "tongue," in reference to the

tongue-shaped wooden ornament which they attach to the under lip. The Inamis had formerly the reputation of being the most warlike and predatory of all the Gran Chaco Indians; but in recent times they have entered into friendly relations with the Brazilians, to whom they supply horses in exchange for cattle. (V. de Saint-Martin.)

Inarticulata, the division of Brachiopoda (q.v.) in which the two valves of the shell are not united by a hinge. It includes the five small families of the *Lingulidæ*, *Cranidæ*, *Discinidæ*, *Obolidæ*, and *Trimerellidæ*, of which all but the first two are extinct. The name is synonymous with Tretenterata, which is now more fashionable.

In articulo mortis, a legal phrase indicating a person's being at the point of death. [WILL.]

Incandescence, the condition of a body when, by reason of its temperature, it emits white light. As the temperature rises the molecular motions become more rapid and give rise to waves in the surrounding medium of greater frequency. At a temperature of about 400° C. the waves emitted are of sufficiently high frequency to have a slight effect upon the eye. The substance then appears of a faint grey colour, which changes to dull red, bright red, orange, yellow, white, and violet, as the temperature is continually raised. A substance at violet-heat, like the sun, is not only giving out violet light, but also light of all colours corresponding to a lower temperature—a fact that is proved by the ordinary experiment of analysing sunlight with a glass prism. High temperature is not alone sufficient to produce brilliant incandescence; a pure hydrogen flame is almost colourless, but it will easily render platinum wire white-hot. The electric arc is much less brilliant than the glowing carbon poles, though at a much higher temperature. In fact, the presence of solid matter is almost essential; not always so, as the incandescent air of a flash of lightning proves. *Incandescent lamps* have filaments of specially-prepared carbonaceous material, enclosed in glass vessels from which the air has been removed as effectually as possible. The ends of the filaments are connected to two terminals on the outside of the lamp by means of platinum wires passing through the glass, and a current of electricity is sent through the lamp by connecting up the circuit with the terminals. The high resistance of the lamp causes a great rise of temperature of the filament, which quickly becomes incandescent. If there be air inside the lamp the filament is burnt away. If the current is too strong the temperature becomes extreme and the filament bursts. A body may give out light without being at a high temperature itself; a glowworm is an example of such a body, but the explanation of this and of the few similar exceptional cases has not yet been given.

Incandescent Lamps. [INCANDESCENCE.]

Incantation, a charm or magic formula, supposed to be efficacious in itself, or recited or sung to add force to magical ceremonies. It is a common belief that incantations are relics of a vanished faith, or remnants of a learning handed down from remote

antiquity, while the body of knowledge of which they formed part has long ago disappeared. The occult writings of the Middle Ages are too mystical to be of much service to the general reader. The poems of Theocritus, Virgil, and Horace furnish us with admirable examples of the use of incantations. By their means sorcerers claimed to be able to command the powers of Nature, to bring down the moon from heaven, and turn back rivers in their courses; to compel the attendance and service of supernatural beings (*cf.* 1 Sam. xxviii. 7-14) [FAUST, MAGIC]; to influence the affections, and to inflict or cure physical injury or disease. Where incantations survive in the present day they are chiefly employed as love-spells or in folk-medicine. An example of the first is found in the rhymes used when a girl sows hemp-seed on Allhallows Eve, to summon her future husband—

“Hemp seed I sow, hemp seed I sow,
Let him that is my true love come after me and mow.”

To the second class belongs the charm quoted by Brand as used by old women in Wiltshire to prevent a thorn-prick from festering, the finger being passed over the wound while the charm is recited—

“Unto the Virgin Mary our Saviour was born,
And on His head He wore the crown of thorn;
If you believe this true, and mind it well,
This hurt will never fester, nor yet swell.”

Incense (“that which is burnt,” Lat. *incensum*), the perfume which arises from burning certain resins and gum-resins. Etymologically the word should denote the substance which is burnt, and this meaning survives in *frankincense* (q.v.)—i.e. “the true incense,” from Old French *franc*. Frankincense was so called because, being the aromatic most easily obtainable from the East, it came to be the only one used for purposes of ritual and fumigation. In the preparation of incense it is now usually mingled with styrax, benzoin, and powdered cascarilla bark. The use of incense is frequently mentioned in the Old Testament, and many existing monuments show that this rite was included in the worship of the ancient Egyptians and Assyrians. From the fourth of the Apostolic Canons it is evident that incense was burnt in the services of the Primitive Church. It is used in the Roman Catholic Church at the Introit, the reading of the Gospel, the offertory, and the Elevation at High Mass, also at the Magnificat and at funerals. Its use, which was discontinued in Protestant countries at the time of the Reformation, has been revived in a few cases by the so-called “Ritualist” party in the Church of England, but its ceremonial use during the Communion Office has been declared illegal. Incense, though specially applied to frankincense (q.v.) as the only genuine or “franc” incense, is a general name for aromatic substances, mostly vegetable resins and gum-resins, which are burnt for their fragrance, generally as a religious ceremonial. Though largely sanitary in origin, especially when used at funerals or in conjunction with the slaughter and burning of animal sacrifices, its use may have been from very early times connected with the general notion that smoke ascended spontaneously heavenward and that “a sweet

savour” was pleasing to the Deity. Among the Jews apparently sometimes frankincense was used alone, and at others a compound known as “ketoreth.” This consisted of equal parts of frankincense, stacte, onycha, and galbanum (Exodus xxx. 34). Stacte was probably the gum or storax (q.v.) of *Styrax officinale*, native to the Levant; onycha was the operculum or small shell on the foot of a species of wing-shell (*Strombus*); and galbanum (q.v.) the gum of the Syrian *Galbanum officinale*.

Incest, the sexual intercourse of persons within the Levitical degrees of kindred. It was during the Protectorate a capital offence, as was also adultery, but at the Restoration this law was not confirmed, and these offences were then relegated to the jurisdiction of the spiritual courts, which determine what kind of sexual connection is incest. The notion of incest is entirely founded upon the consanguinity or affinity of the parties.

Inchbald, MRS. ELIZABETH, the daughter of a farmer named Simpson, was born at Standingfield, Essex, in 1753. Her father died when she was eight, and though poverty prevented her receiving a regular education, she and her sisters cultivated of their own accord literary tastes and domestic sympathies. In 1772 she came to London secretly, and tried to get a theatrical engagement in spite of an impediment in her speech. Mr. Inchbald, an actor at Drury Lane, made her his wife, and for six years they played together in the provinces. On his death, in 1778, she remained for a time on the stage, but her success as a dramatist enabled her to retire in 1789. Among her successful plays were *Wives as They Were and Maids as They Are*, *The Married Man*, *The Wedding Day*, *Lovers' Vows*, and *The Midnight Hour*. Her two romances, *A Simple Story* and *Nature and Art*, still find readers, and her *British Theatre*, *Modern Theatre*, and *Collection of Farces* are standard compilations. She destroyed her autobiography before her death, but Boaden's *Memoirs* give a full account of her life, which ended in 1821.

In Coena Domini, a Papal bull, originally promulgated in the Middle Ages, which received its final form from Urban VIII. in 1627. It was so called because originally it was read on Maundy Thursday, the day of the “Supper of the Lord.” It contained a summary of the claims of the Roman Church, and excommunicated those who infringe her rights or dispute her doctrines. Clement XIV. discontinued its publication in 1773.

Income Tax is a tax on the yearly profits arising from property, professions, trades, and offices. In the year 1842, the revenue of the United Kingdom being insufficient to meet the public expenditure, it was decided to revive a tax which had in past times been levied in emergencies. Accordingly this tax was reimposed—in the first instance for three years only; but at the expiration of that term, and ever since, by renewals, its existence has been prolonged, though its rate in the pound has frequently varied by successive Acts of Parliament. In the case of property, the tenant or occupier is primarily liable to pay the tax, but he is entitled to deduct a proportionate

part from his rent, and he cannot by any agreement with his landlord deprive himself of this right. Where the income—from all sources—is under £150 a year, it is free of income tax, and any sums paid therefor in respect of property are recoverable for a period of three years from their payment. There is an office at Somerset House specially appointed to deal with applications for return of income tax. Also where the income does not exceed £400 per annum, an allowance of £120 per annum is made, the tax is calculated upon the difference, and there is also in all cases a deduction allowed for life insurance premiums to a limited extent.

Incompletæ (MONOCHLAMYDEÆ or APETALÆ), a sub-class of Dicotyledons (q.v.), characterised by the reduction of the perianth to a single whorl, generally sepaloid, or by its entire absence. The plants of this sub-class are also usually diclinous (q.v.). They are probably, in most cases at least, degraded types; but their distribution among their nearest dichlamydeous allies, though it has been attempted, is a matter of the greatest difficulty. They are subdivided into the two series *Hypogynæ*, with a superior ovary, and *Epigynæ*, with an inferior ovary, the former series containing seven, and the latter three, cohorts; but there is very little apparent direct relation between these cohorts. The hypogynous ones are *Piperales*, the peppers (q.v.); *Urticales*, the nettles, figs, mulberries, hemp, hop, elms, and planes; *Amentales*, or catkin-bearers; *Euphorbiales*, the spurges [EUPHORBACEÆ], *Daphnales*, including daphnes, proteads, bays, and nutmegs; *Chenopodiales*, including spinachs, amaranths, rhubarbs, docks, etc., and *Nepenthales*, the pitcher-plants. The epigynous ones are *Quernales*, the oaks, beeches, hazels, walnuts, etc., the *Asarales*, including Aristolochia (q.v.) and Asarabacca (q.v.), and *Santalales*, including sandal-woods and mistletoe.

Increment, UNEARNED, an expression denoting the increase which takes place in the value of landed property without any exertions on the part of its owners.

Incubus. [DEMONOLOGY.]

Indemnity, a written memorandum or undertaking to secure the party to whom it is given from all danger and damage that may ensue from any act or omission of the party giving it. An Act of Indemnity used to be passed by Parliament, annually for relief of those who had neglected to take the necessary oaths of office, etc. [GUARANTEE.]

Indenture. [DEED.]

Independents, a Christian body, identical with the present Congregationalists, which grew up in England during the reign of Elizabeth. They differed from Episcopalians in having no gradation of ministry or succession of orders, and from Presbyterians in having no gradation of courts or assemblies exercising any authoritative or judicial functions. Ecclesiastical government in any form was by them entirely rejected, and each congregation became an independent and separate body of

worshippers, which looked for guidance to the Almighty alone. Regarding the Bible as the sole standard of faith and doctrine, and holding that the individual believer is competent to interpret it for himself, they were indifferent to the voice of antiquity, the decisions of councils, and the tradition of the Church. Their doctrinal views were consequently somewhat vague, but in the main they agreed with those of other Puritans. The religious principles of the Independents were first set forth in a series of tracts, published chiefly between 1571 and 1581, by Robert Browne, a clergyman and graduate of Cambridge. Although Browne himself subsequently conformed, his views were adopted by a large number of persons, especially in the eastern counties, who became known as Brownists. Several congregations were formed in London and elsewhere, but religious dissent was still regarded as a crime against the State. The Independents were driven to worship in secret; when discovered they were thrown into prison, and five of their leaders, including Henry Barrowe, a barrister of Gray's Inn, were put to death. A large number were banished, and the year of Barrowe's execution (1593) was marked also by the settlement of many exiled Brownists in Holland. After the arrival of John Robinson in 1608, who was followed two years later by Henry Jacob, a church was formed at Leyden, which has been called the "parent of Independency alike in England and America;" and this is literally true, for in 1616 Jacob returned to England and made use of his experience in organisation to found the first regularly-constituted English Independent church, whilst the band of Pilgrim Fathers which sailed to New England in the *Mayflower* (1620) was composed of members of the Leyden congregation. It is computed that within the next twenty years the original settlers were joined by 25,000 new emigrants from England, and the success of the American colony gave a powerful stimulus to the system at home, notwithstanding the repressive measures of Laud. Up to the period of the Civil War, however, it had gained no great hold over the people at large, and the outbreak of hostilities, in so far as it resulted from religious causes, was due less to the Independents than to the Presbyterians, a party as firmly opposed to the principles of toleration which the Independents advocated as the Episcopalians themselves. But with the ascendancy of Cromwell and the victories of the New Model the influence of Independency extended, and it finally took the place of Presbyterianism as the religious basis of the revolution. During the period of the Commonwealth the Independents showed that their attachment to their peculiar system was not so great as to prevent them from adapting themselves to existing ecclesiastical arrangements. Many of them accepted benefices and received titles, though at the same time there was an attempt to create a special Independent Church side by side with the parochial organisation. In 1658 a synod of Independent Churches was held in London, which drew up the Savoy Declaration, following in doctrine the Westminster Confession, but adding their peculiar theory of Church government. The restoration of Charles II. was followed

by a series of Acts depriving Nonconformists of all religious privileges, but these were to some extent regained by the Toleration Act of 1689. Since then the various civil and religious disabilities of Independents and other Dissenters have been gradually removed. The Congregationalists are now united in a "Congregational Union of England" with subordinate "County Unions."

Index Librorum Prohibitorum, or INDEX EXPURGATORIUS, an official list issued by the Roman Catholic Church, containing the names of all works the reading of which is forbidden on the ground that they tend to promote infidelity, heresy, or immorality. The edict of Constantine the Great, suppressing the writings of Arius, after they had been condemned in the Council of Nicæa (A.D. 325), was the first of a series of imperial and Papal decrees which sought to uphold the authority of the Church in this matter. The first catalogue of prohibited works is said to date from the pontificate of Gelasius (494). The suppression of pernicious literature was generally entrusted to the bishops, but it afterwards became one of the functions of the Inquisition. The decree *De Impressione Librorum*, issued by the Lateran Council in 1515, enacted that before being printed a work must receive ecclesiastical sanction. The first Roman index, in the modern sense of the word, was published by Pope Paul IV. in 1557. Owing to the vast increase in the number of unlicensed works, many of them containing direct attacks on the Papacy, which resulted from the Reformation, it was found necessary at the Council of Trent to entrust the preparation of a complete catalogue to a specially-appointed committee (1562). As its labours were unfinished when the council came to a close, the work was carried on by Pope Pius IV., who in 1564 issued an index which forms the basis of that now in force. It was accompanied by the "Ten Rules," explaining the principles on which it was drawn up and intended to serve as a guide for the revision and extension of the list. This task is now carried out by the "Congregation of the Index," comprising a prefect and other cardinals, together with "consulters" and "examiners of books." Besides books absolutely prohibited, there are others which may be read after the objectionable passages have been expunged. The Congregation has shown itself quite unable to keep pace with the growth of modern literature, and some of the most formidable attacks on the Roman system are omitted in the catalogue.

India. [For general article on this subject, see vol. vi.]

Indiana, one of the United States of North America, situated between Lake Michigan and the Ohio river, which forms its southern boundary. Its eastern and western limits are represented pretty closely by the meridians $84^{\circ} 49'$ and $88^{\circ} 2'$ west longitude. The length is 276 miles, the breadth about 145 miles, and the area 33,809 square miles. The surface generally consists of an undulating table-land, having a mean elevation of 735 feet. above sea-level, and sloping slightly to south-west. There are no mountains, and the diversities of

level are mainly produced by the numerous rivers, of which the Ohio, the Wabash, the two branches of the White River, and the Maumee are the chief. Towards the north open prairies are the prevailing feature, but the southern portion of the state was originally covered with dense forests. Coal is very abundant, but not of uniformly good quality, and building-stone, fire-clay, and kaolin are also found in large quantities. As elsewhere, the carboniferous strata contain caves, that of Wyandotte being remarkable for its size. The soil is adapted to the growth of wheat and other cereals, maize, fruits, and vegetables. Immense numbers of cattle, sheep, horses, and swine are bred in the pasture-lands and forests, and honey is an important product. Manufactures and trade have developed enormously during the last fifty years, and, besides the great main lines traversing the state from east to west, a network of nearly 5,000 miles of railway spreads over the entire surface. The educational system is admirable, and more than 70 per cent. of the population under twenty-one find place in the schools. The State University is at Bloomington, and Normal School at Terre Haute, and the Agricultural College at Lafayette. Indianapolis is the capital, and other important towns are Evansville, Fort Wayne, Terre Haute, New Albany, and Lafayette.

Indianapolis, the capital of the above state, is placed almost in the exact centre, and is distant 194 miles south-east from Chicago, and 824 miles west of New York. The site was formally selected, and the city laid out in 1821, in the solitude of the virgin forest. The ground-plan closely follows the lines of Washington and other American capitals, the streets being disposed in rectangular fashion. In 1824 the state capital was transferred hither from Corydon. Pork and corn are the chief sources of prosperity, but many important manufacturing and commercial interests have grown up with the growth of the place. Among the public buildings are the State House, just completed at a cost of two millions of dollars, the public library, the arsenal, and the Marion Court House. Twelve main lines of railway meet at the Union Dépôt, and the traffic is enormous.

Indian Fire, a mixture used chiefly for purposes of pyrotechny and signal lighting. It burns with a fine white light, and is composed of a finely-powdered and intimate mixture of *nitre*, 24 parts; *sulphur*, 7 parts; and *realgar* (q.v.), 2 parts.

Indian Ink, or CHINESE INK, appears to have been in use among the Chinese since the year 250 B.C., while other kinds of ink date from a still earlier period. It is made from lampblack held together by some medium, usually animal glue. The lampblack is obtained by burning resinous matter, or, in case of better qualities, oil of sesamum. The soot, consisting almost entirely of animal charcoal, is collected and thoroughly mixed up with a still liquid glue, and then placed in wooden moulds to harden and dry. Camphor and various perfumes are occasionally added to scent the ink or improve its colour. It is employed largely by draughtsmen and by artists, giving a better colour and being easier to work with than ordinary ink.

Indian Mutiny. [INDIA.]

Indian Ocean, the name given to the vast body of water that extends upwards from the Southern Ocean between the continents of Africa and Australia, and, reaching the Asiatic coast, is split up by the Indian peninsula into the Arabian Sea west, and the Bay of Bengal east. The 38th parallel of south latitude may be taken as its lower limit, the configuration of the bed showing a sort of natural boundary along this line, and the whole area of 17,000,000 square miles is unevenly divided by the Equator. The Red Sea and the Persian Gulf branch out to the north-west, and a wide channel, dotted with islands to the east, opens into the Pacific. The average depth is 2,500 fathoms, but this is considerably increased between Java and Australia, whilst a diminution of 1,000 fathoms takes place along the southern limit, and is marked by the volcanic islets of St. Paul, New Amsterdam, the Crozets, the Kerguelen, Prince Edward, and Heard groups. Madagascar, Mauritius, Bourbon, the Seychelles, the Comoro and Chagos groups, the Maldives and Laccadives, and Socotra, rise from comparatively shallow banks in the western portion, whilst Ceylon, the Andaman, and Nicobar clusters mark a similar platform at the entrance of the Bay of Bengal. The currents, especially in the northern half, are considerably affected by periodical winds.

Indian Red, a mineral obtained chiefly from the localities of the Persian Gulf. It is employed to an extent as a pigment, and consists chiefly of silicate of iron.

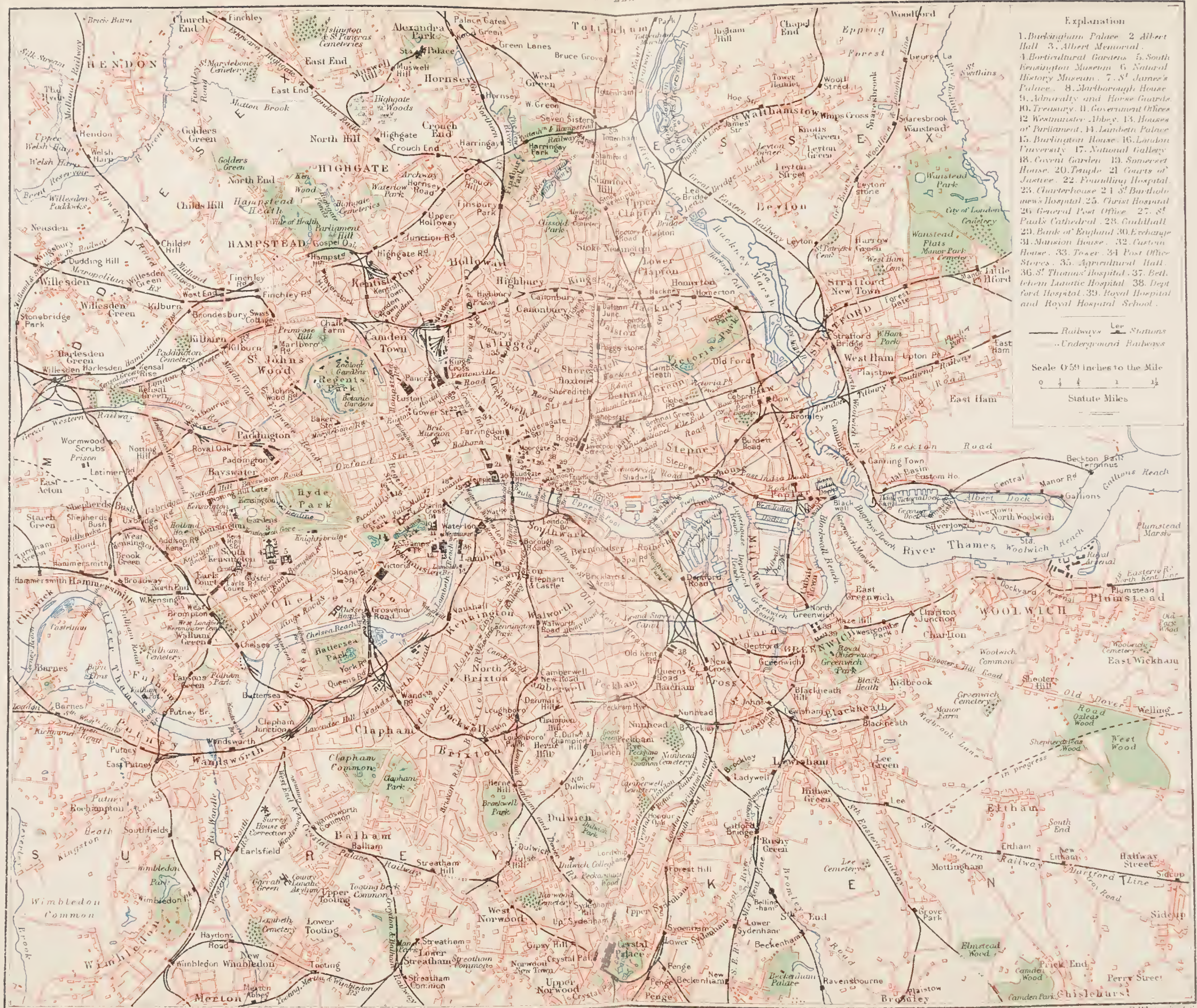
Indian OR Western Territory. 1. An area set apart by the Government of the United States as

the dwelling-place of dispossessed tribes of Indians. It extends over some 70,000 square miles, being bounded N. by Kansas, S. and W. by Texas, and E. by Arkansas. Crossing this tract from E. to W., you pass first through a stretch of rich prairie intersected by many streams, next through a belt of forest, and finally reach the Great Plains that slope up to the Rocky Mountains. There are few elevations over 1,000 feet, except in the E. portion. The Arkansas river, with its tributaries, drains the upper and central district, and the Red River forms the S. boundary. The inhabitants, mostly compulsory immigrants, are settled according to tribes on defined reservations, and include representatives of almost all the primitive families, such as the Choctaws, Cherokees, Osages, Modocs, Shawnees, Pawnees, Apaches, etc. The Missouri, Kansas, and Texas Railway crosses the territory, which is dependent to some extent on Arkansas for its government.

2. The name is also given to a tract of British America beyond the Hudson Bay Company's demesne, and vaguely bounded by the latitude 52° 30' and 70° and by the longitude 103° and 141°. This country is thinly populated by native hunters and a few white traders.

Indian Yellow. Two colouring materials are known under this name—(1) an organic dye, known also as *azo-yellow* or *azo-flavin*; (2) a pigment, known also as *purree*, which is extensively employed in India for the manufacture of paints for woodwork, etc., or of water-colours. It is prepared from the urine of cows fed upon mango leaves, and comes into commerce in the form of round balls of a yellow colour.

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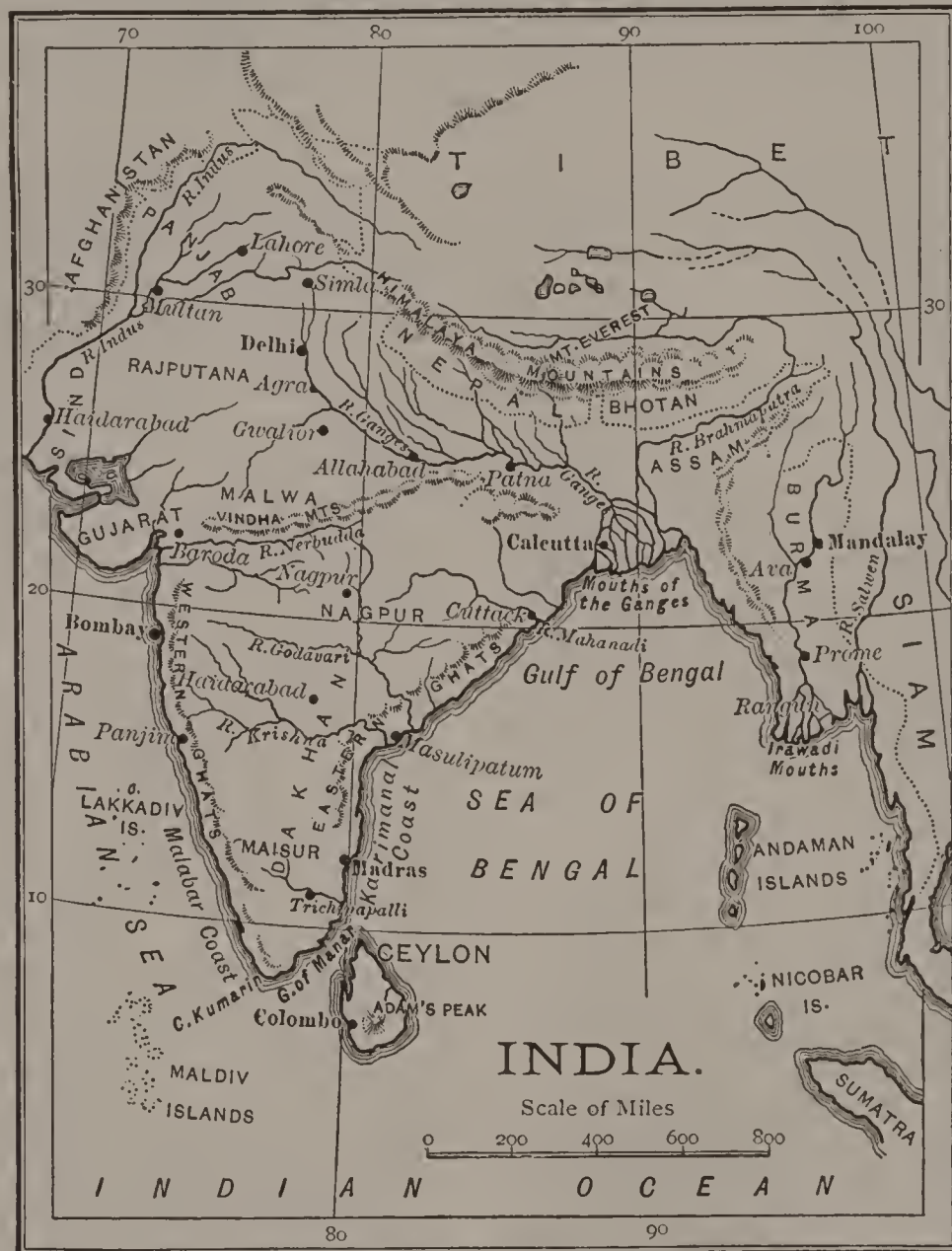
India. *Geography.* India, says an old writer, "is properly called that great province of Asia in which great Alexander kept his warres, and which was so named of the river Indus." From this its original application to the country on the banks of the Indus, the name spread to the whole plain between and including the valleys of the Indus and Ganges, and in a vaguer sense to all the regions beyond. Ptolemy distinguished India "intra Gangem" from India "extra Gangem," and later we find *India major*, meaning probably northern India, that is, the Indo-Gangetic plain or Hindustan proper, and *India minor*, the peninsula and tableland which projects due south into the Indian Ocean, and narrows to a point at Cape Comorin over against the island of Ceylon. The etymology of the word is simple. The Sanskrit name of the great river which impressed the imagination of invaders from the north-west was *Sindhu*. This became *Hindu* in the Persian, and so passed into the Greek forms *Ἰνδοί* (the people), *Ἰνδός* (the river), and *Ἰνδική* (the country on the banks of the river), which are first met with in a fragment of Hecataeus of Miletus about 500 B.C., and in Herodotus. For many centuries, however, the conception of India was vague, and its twofold signification gave rise to the plural form of "the Indies," which became later the "East Indies," in contra-distinction to the "West Indies," and survives in "les Indes." To European nations who have possessions in the East the term "India" expresses the extent of their possessions. Thus the Portuguese have a Governor-General of India, meaning Goa and its small dependencies Daman and Diu. Spaniards and Dutch, in speaking of India, mean their respective island possessions in the Eastern Archipelago. To an Englishman the name expresses not only India proper as understood by the world at large—that is, the whole of the great province of Asia comprising three well-defined regions: (1) the southern slopes of the long line of the Himalayas and connected ranges, (2) the broad belt of alluvial plain which lies at the foot of the mountains, and extends across the country from sea to sea, a distance of 1,700 miles, (3) the tableland, which with a margin of alluvial coast forms the rest of the peninsula—it includes also Burma, which, as part of "further India" or the Indo-Chinese peninsula, appears on the map as a pendent of the peninsula fringing the Eastern waters of the Bay of Bengal. Thus we arrive at "British India,"

an Empire which in extent is larger than the Continent of Europe without Russia, and supports one-fifth of the population of the world. It is about 2,000 miles from the southernmost point of Cape Comorin to the Hindu Kush, the extension of the Himalaya range which bounds the northern dependencies of the feudatory state of Kashmir, and separates the river systems of the Indus and the Oxus. The distance is about the same from the Mekong river, where it touches the dependencies of Burma, to the Suleiman range which separates Sind from Baluchistan. It is doubtful whether the latter country should not also at the present time (1893) be included as a native state forming part of the system of the British Indian Empire. But if it be excluded the frontier extends 6,580 miles by sea and about 5,000 miles by land, from the mouth of the little river Hab, 20 miles west of Karachi, to the southernmost point of Tenasserim east of the Bay of Bengal. It is noticeable that in all this length of coast there are so few good harbours; on the eastern side of the peninsula practically none. On the land frontier in like manner the practicable passes through the mountains are few. The Khaibar pass from Northern and the Bolan from Southern Afghanistan have been crossed by invading armies. Across the Hindu Kush the most practicable passes are the Dorah, the Baroghil, and the Baikra from the Oxus valley, and the Karakoram from Chinese Turkestan.

The most striking feature of Peninsular India is the range of the Western Ghats, which forms a great wall close to the western coast, and stretches from the Gulf of Cambay to the far south, with a gap at Beypore. This range, averaging a height of 3,000 feet and rising in the Nilgiris to 8,760 feet, faces the south-western monsoon, and consequently draws down on its western slopes a large portion of the moisture which the monsoon winds bring from the ocean. East of the range the rainfall is relatively light. The watershed of the peninsula being so close to the western coast, the streams draining into the Arabian Sea are insignificant, until we reach the Gulf of Cambay. Here the rivers Tapti and Nerbada, which drain the northern portion of the peninsula, have their outflow north of the Western Ghats range. The other important rivers of the peninsula, Mahanadi, Godavari, Kistna or Krishna, and Kaveri, flow eastwards, and form large and fertile deltas. The peninsula forms

a huge tableland sloping gradually eastwards from the Western Ghats. What are called the Eastern Ghats may be described as the eastern scarp of this tableland. The northern edge of the plateau is marked by the Vindhya and Satpura ranges stretching east from the bay of Cambay to the highlands of the Central Provinces, from which other hill ranges extend into Bengal. Till British enterprise opened up the country by roads and railways the Vindhya and Satpura hills and their

Gondwana series of rocks, which are entirely of fresh-water origin, and are not only of geological interest but also of economic value, as they contain the chief coalfields of India. The only other rock of peninsular India which need be mentioned is the Dakhan trap, a basaltic rock covering over 200,000 square miles of area, and furnishing the rich black cotton soil of the Dakhan. The great volcanic outbursts which produced this trap commenced in the cretaceous period and lasted into Eocene times.



MAP OF INDIA.

continuations to Bengal shut off Hindustan from the Dakhan or Southern India and hindered the political consolidation of the country.

Geology. In this great tableland of peninsular India the oldest rocks consist of gneiss, found in three tracts—in Bundelkhand, where they are oldest of all, among the Aravalli ranges which flank the Rajputana desert on the south-east, and through a large part of Bengal and Madras extending to Ceylon. Next in antiquity are the Transition rocks; then the Vindhyan rocks, which are of sandstone of very early Palæozoic formation, but containing no fossils as yet discovered. Between the Narbada and the Son, a tributary of the Ganges on the north and the Kistna on the south, lie the

The second division of India, the Indo-Gangetic plain, is of recent geological formation, much of it a very late gift of the Indus and Ganges rivers. The watershed between these two river systems is at its lowest point only 924 feet above the sea; thence the plain slopes gently for 1,050 miles in one direction to the Bay of Bengal, and 850 miles in the other to the Arabian Sea. This region, which has an area of 300,000 square miles, is the most populous and fertile part of India. On the west, however, it includes the comparatively rainless and waterless deserts of Sind and Rajputana. At its eastern extremity the rainfall is of the heaviest. The meteorological station which has recorded the largest rainfall in the world—481 inches of rain in

an average year and 805 inches in one exceptionally rainy year — is Chara Punji in Assam at the eastern corner of the Indo-Gangetic plain. The south-western monsoon, laden with moisture, breaks on the Assam hills and the southern slopes of the Himalayas with even greater force than on the Western Ghats. Blocked to the northward by the towering Himalayas the monsoon current is turned westwards up the Ganges valley, and delivers its moisture in decreasing showers as it moves towards the Punjab. The whole of the enormous rainfall on the Himalayas finds its way to the sea by the Ganges or Indus. The Indus, the Sutlej, and the Sanpo or Brahmaputra rise close together on the northern Himalayas, and the Jumna, Ganges, and Gogra at no very distant points in the range. The other rivers find their way by courses more or less direct to the plains of Hindustan, but the Indus turning north-west has to work its course round the north of Kashmir before it finds an opening southwards to enter the Punjab, and the Sanpo flows east through the whole length of Tibet before it finds the gorge of the Dihong through which to pour its waters by the Brahmaputra channel into the Bay of Bengal.

Embraced by these two rivers, the third or Himalayan region, which for 1,500 miles shuts off India from the rest of Asia, lies in great part beyond the political frontiers of India. Its geology in consequence is imperfectly known. This range, which is rightly termed Himalaya or the abode of snow, is seldom lower than 18,000 feet, and contains the highest peaks in the world, Kinchanganja, 28,176 feet, and Gaurisankar or Everest, 29,000 feet. Stretching from east to west with an increasingly northern inclination till it loses itself in the knot of highlands called the Pamirs, it forms the southern rampart of the barren plateau of Tibet, which is itself generally 15,000 feet above the level of the sea.

The elevation of the Himalayan region and the depression of the Indo-Gangetic plain were probably contemporaneous. The great disturbance which produced them is believed to have taken place after the deposition of the Eocene beds. The Northern Himalayan or Ladakh range consists of old gneissic rocks. In the central region there are two gneissic axes separated by a trough or synclinal valley containing fossiliferous beds. South of this true Himalayan range, to the east of the Sutlej gorge, is the Lower Himalaya tract, in which the beds are greatly disturbed, sometimes even inverted over large areas. Yet farther south is the sub-Himalayan range, composed of later tertiary rocks (Siwaliks, etc.). The salt range in the north-west of the Punjab has a special geological interest because it contains, without evidence of any important break in succession, representatives of the great European formations of Silurian and later epochs.

The Hindu Kush, which forms the north-western boundary of the empire, is a continuation of the Himalayas. Southwards from this extremity of the Himalayan range stretch mountainous offshoots which reach almost to the sea, the most important line being known under the names of Safed Koh,

Suleiman, and Hala mountains. The rainfall on these southern ranges is relatively scanty. From the eastern extremity of the Himalayas also stretch southern offshoots which form the Naga and Patkoi hills of Assam and the Yomas of Burma. These hill ranges with the intervening alluvial valleys of the Irawadi, Sittang, and Salween form the fourth region of the Indian Empire. The rainfall near the coast here in Bengal is excessive, but rapidly diminishes farther inland.

Flora. India has no distinctive botanical features peculiar to itself. Its vegetation is of a composite character, including the flora of Persia and the south-eastern Mediterranean area to the north-west, of Siberia to the north, of China to the east, and of Malay to the south-east. The Himalayas present a great variety of flora, varying from that of the Malayan type, which luxuriates in the hot humid belt at the base, to the temperate and even arctic flora at higher altitudes. Eastwards this flora approximates to the Chinese, westwards to the Mediterranean type, the tea-tree being found at the one extremity, the holm oak and the hawthorn at the other. Pines are common from one end of these mountains to the other. The deodar, which is allied to the cedar of Lebanon, is perhaps the most conspicuous. The dry country of the north-western area in Sind, Punjab, and Rajputana is characterised by low scattered jungle of thorn and tamarisk. Contrasted with this is the Malayan vegetation in the humid regions of India, such as Assam and Burma and the bases of the Eastern Himalayas, and on the Malabar Coast. In this region are to be found rubber-yielding trees and teak forests. Midway between these types comes the flora of Western India with its regions of moderate rainfall. Here the forests, besides containing teak, produce toon and sal trees which are valuable for their timber. Satin-wood and sandal-wood are also found in this region.

Fauna. The wild animals of India include the lion, which is now only found in the sandy deserts of Gujarat, the tiger and the panther, which throughout India are very destructive of cattle and human life, wolves with their kin the jackals and wild dogs of various species, bears of which the common black or sloth kind is found throughout India; the elephant, which has been exterminated in many districts, and is now protected under a Government monopoly; the rhinoceros, of which there are four varieties; the wild hog, the animal which affords the exciting sport of "pig-sticking"; the wild ass, which exists, but is hard to approach, in the deserts of Sind and Kutch; wild sheep and goats, including the *ovis ammon*, and *ovis poli* of Tibet; antelopes and deer of various species; the bison, which is one of the most dangerous of big game, with rats and reptiles of many disagreeable kinds. Much trouble is taken and expense incurred by Government for the destruction of dangerous wild animals and snakes. This is justified by the fact that in one year (1891) 24,300 persons and 70,816 cattle were killed by wild animals and snakes. Among birds the parrot tribe are the most remarkable for beauty. Fish swarm in the Indian rivers, the carp tribe predominating. The Gangetic

dolphin, 6 to 12 feet long, is found hundreds of miles up the Ganges and Indus. The mahsir, a species of barbel, is the finest of Indian fish from the angler's point of view. Insects are innumerable.

The following table shows the population of the British Empire in India, divided into provinces and native states, or groups of native states, according to the preliminary returns of the census of 1891 :—

The circumstances and condition of the people vary greatly in different parts of India. The lower Gangetic plain carries a rural population at a rate of 400 to 800 to the square mile. Indeed, in large tracts of Bengal two persons have to live on the proceeds of each cultivated acre. On the other hand, the Central Provinces, Burma, Assam, Rajputana, and parts of the Punjab, have a population

Provinces, etc., under the Administration of :	Area in Square Miles.	Number of Occupied Houses.	Population in 1891.	Increase per cent. since 1881.	No. per Square Mile.
The Governor-General of India—					
Ajmere and Merwara	2,711	102,654	542,358	17·72	200
Berar	17,718	591,008	2,897,491	8·41	164
Coorg	1,583	26,806	173,055	—2·94	109
Andaman Islands (Port Blair only)	12	2,997	15,609	7·12	—
Baluchistan Cantonments	(?) 10	4,543	27,270	—	—
Laccadive Islands	(?) 80	2,899	14,410	—0·44	—
Governors—					
Madras	141,189	6,709,990	35,630,440	14·31	252
Bombay (including Sind and Aden)	125,202	3,380,640	18,901,123	14·51	151
Lieutenant-Governors—					
Bengal	151,543	13,592,154	71,346,987	6·87	473
North-West Provinces and Oudh	107,503	8,225,191	46,905,085	6·24	436
Punjab	110,667	3,127,823	20,866,847	10·70	189
Chief Commissioners—					
Assam	49,004	1,118,885	5,374,759	12·2	112
Burma { Lower	87,975	869,132	4,558,627	24·67	53
{ Upper	83,473	554,472	2,946,933	—	35
Central Provinces	86,501	2,158,668	10,784,294	9·61	125
Total British India	965,171	40,466,862	220,985,288	11·72	230
NATIVE STATES.					
Under the Government of India—					
Haidarabad	82,698	2,278,802	11,537,040	17·18	140
Baroda	8,226	538,967	2,415,396	10·54	294
Mysore	28,082	824,446	4,943,604	18·09	176
Kashmir	80,900	447,993	2,543,952	63·34	31
Rajputana Agency	130,268	2,177,425	12,016,102	17·02	91
Central India Agency	77,808	1,961,771	10,318,812	11·37	137
Bombay	69,045	1,596,132	8,059,298	16·11	117
Madras	9,609	726,966	3,700,622	23·3	385
Bengal	35,834	584,912	3,296,379	18·18	92
Central Provinces	29,435	409,096	2,160,511	26·37	73
North-West Provinces	5,109	132,815	792,491	6·84	156
Punjab	38,299	713,735	4,263,280	10·40	111
Total Native States	595,313	12,393,060	66,047,487	16·78	111
Grand Total India	1,560,484	52,860,822	287,032,775	13·03	185

Note.—From these figures are excluded the area of the Andaman Islands outside the penal settlements, and its aboriginal population, the area and population of Manipur (estimated 8,000 sq. miles and 250,000 respectively), Sikkim (2,702 sq. miles and 30,458), Baluchistan Agency, the Shan States (estimated 44,000 sq. miles and 372,969), and the Burmese frontier tracts (population 116,493). To these figures may also be added :—

	Area in Sq. Miles.	Popula- tion.	No. per Sq. Mile.
Portuguese Settlements ...	1,605	561,384	349
French Settlements	203	282,923	1,393

of less than 150 to the square mile. The rainfall ranges from 100 inches to less than 10. The tenures and the distribution of profits from land vary greatly. With early marriages almost universal, the population increases yearly at a rate varying from $\frac{1}{2}$ per cent. per annum in the Upper Gangetic plain to 4 per cent. per annum in Burma. There is no poor law or system of poor relief, except in famine times, but there is everywhere a widespread and open-handed charity. In the overcrowded districts, like North Behar, and where, as in parts of the Dakhan, the soil is very poor, the condition of the landless labourers is deplorably low ; but in most years and in most districts the position of the peasantry is

fairly prosperous, and, so far as the ordinary tests can be applied, is steadily improving. There is an appreciable emigration from the crowded districts to Assam and Burma, as well as to Ceylon, the Straits Settlements, to various colonies in the West Indies, and elsewhere.

The population, divided according to religions, shows a total of 207,731,727 Hindus, 57,321,164 Muhammadans, 7,131,361 Buddhists, almost all in Burma, and 2,284,380 Christians, of which the majority are Roman Catholics. Education has been extended to but a small, though increasing, portion of the people, there being only 12,097,530 persons who can read and write, and 3,195,220 under instruction, out of a total population of nearly 290,000,000. There are five universities in India, those of Calcutta, Madras, and Bombay, the Punjab University, established at Lahore, and one at Allahabad for the North-Western Provinces. These are modelled on the fashion of the London University, and by their examinations determine the course of instruction in the higher schools and colleges of India. Under British rule a vernacular press and literature have arisen.

Christianity in India, if the traditions of Southern India are to be believed, was founded by the Apostle St. Thomas, who met his death as a martyr near Madras in A.D. 68. A revival of the faith is also said to have been caused by the mission of several bishops from Babylon at the close of the 5th century. The 300,000 Syrian (Nestorian) Christians now in India still testify to the work of those early missionaries. The Portuguese combined conquest and conversion. With the arrival of St. Francis Xavier in 1542 began the well-directed and successful labours of the Jesuit missions in Southern India. For a time it seemed not unlikely that Christianity under their teaching would be established throughout a large part of Northern India as well, but with the decline of the Portuguese power and the suppression by Portugal of the Society of Jesus in 1759 the cause languished. Since, however, the re-establishment of the order in 1814 its missions have made great progress, and the Roman Catholics in India continue to increase.

The pioneers of Protestantism were Lutherans, whose missions at Tranquebar date from 1705. The Baptists under Carey began their work at Serampore in 1793, and were followed by the London Missionary Society in 1813. The opposition of the East India Company to Protestant missionary effort was withdrawn in that year. A bishopric of Calcutta was established in the following year, and from that time the Church of England has kept up a missionary connection with India, its labours being supplemented since 1830 by the Presbyterians and by the missions of numerous societies European and American.

The Christian population for all India was in 1890 as follows:—Syrian Church, 300,000, Roman Catholics, 1,594,901, Native Protestants, 648,843, total, 2,543,744, or an increase of about 46 per cent. in twenty years. These figures exclude European Christians in India.

History. Ancient India: The first precise date in Indian history is that of Alexander's invasion (327

B.C.). The general progress of Indian civilisation, however, before this date, can be learnt from the ancient Sanskrit literature of India, of which the earliest portions are the *Vedas*. The oldest of these, the *Rig Veda*, is a kind of hymnal, composed, it is guessed, about 1400 B.C. There are four other *Vedas* of later date and less sanctity. As commentaries and additions to the *Vedas* were written the Brahmanas, Sutras, Upanishads, and Puranas, which are chiefly treatises on theology and ceremonial. In other treatises of Brahmanical literature astronomy, music, and medicine are dealt with in an original way; but more important are the legal maxims, collected into the so-called *Code of Manu* about 500 B.C. Besides these books there are two great Sanskrit epics, the *Mahabharata* and the *Ramayana*, and a Sanskrit drama of which the best known writer was Kalidasa, who flourished in the last century before Christ. Early Buddhism has also recorded itself in certain writings, which were collected in three volumes (*tripitaka*), and edited in the fifth century before Christ.

Sanskrit, the language of all this literature, is clearly and closely allied to the principal languages of Europe. The Aryans, who spoke it, originally worshipped the sky, sun, fire, water, and other natural powers under various names; sometimes, however, grasping at the unity of the Godhead under a multiplicity of manifestations. In their earliest poems these people appear to the north-west of India, about to cross the Indus, and as they proceed they drive before them the "black-skinned" natives of pre-Aryan India. It was probably centuries before the Aryans fully occupied the whole of the Gangetic plain. At the first they are not priestridden or divided into castes; but at an early date four castes are found to be established: first, the priests, or Brahmanas, the twice-born; secondly, the fighting caste, the Rajputs or Kshatriyas; then the Vaisyas or Aryan agricultural settlers; and lastly, the Sudras, who are the aboriginal or mixed populations reduced to serfdom. Originating in this classification, the castes of India are now multiplied indefinitely, with cross divisions of race, place, and occupation. All society is organised on a system of caste, which forbids members of different castes to intermarry or eat together, prescribes and proscribes articles of food, and confines families to particular occupations. Rules for preserving caste distinctions are most dogmatically laid down in the *Code of Manu*.

About B.C. 543 there rose a great reformer to protest against the exclusiveness and tyranny of caste and of the Brahman priesthood. Gautama Buddha succeeded by a long life of teaching and of simple goodness in establishing a new religion, which insisted on the common brotherhood of men without distinctions of caste. His creed, which recognised no God, was gradually adopted throughout India, and by the efforts of its missionaries was extended to Ceylon, Tibet, China, and the Indo-Chinese peninsula. It found its Constantine the Great in the great king Asoka, who was converted in B.C. 257, and established Buddhism as the State religion of his kingdom of Magadha or Behar. Nevertheless Buddhism never ejected Brahmanism from India. The two existed side by side till about the tenth

century (A.D.), by which time the latter had gradually renewed its strength, and in its modified form of Hinduism finally displaced Buddhism as a popular faith in India itself. In Ceylon and Burma Buddhism still lives, but in India the kindred sect of the Jains is its only representative.

The grandfather of Asoka was Chandragupta, the Greek Sandracottus, whose court and country are described by Megasthenes. Alexander the Great, in overthrowing the Persian Empire, had carried his arms into its most eastern provinces of Punjab and Sind. By the reluctance of his troops to advance farther east, he had been compelled to forego the conquest of Hindustan; and, dying shortly afterwards, he left the eastern portion of his new empire to Seleucus Nicator, who, consolidating his power in Syria, parted with his outlying dependencies of Cabul and the Punjab to the Indian potentate, Chandragupta, and stationed an ambassador at his court. This ambassador, Megasthenes, in describing the country, notices the absence of slavery in India, the chastity of the women, and the courage of the men. He speaks of their honesty and absolute truthfulness, and mentions that they never resorted to litigation. He divides India into 118 kingdoms, some with suzerain rights; and he describes the village communities of India as not unlike independent Greek republics.

A succession of inroads of Scythian or Tartar tribes between 130 B.C. and 500 A.D. swept away the remnants of Greek settlements and Greek influence in Bactria and India, and established a Scythic monarchy in Hindustan. Their kings were converted to Buddhism and aided its diffusion; and, when Buddhism gave way finally to Hinduism, the Scythic element no doubt had its effect on the social and religious development of the new creed, depriving it of its old exclusiveness, and adapting it to receive within its folds and under its limitations the multitudinous gods and cults of neighbouring non-Aryan tribes.

Muhammadan India. Another religion was brought into India by the next series of invaders. These were the Muhammadan conquerors (Turkis, Afghans, and Moghuls), who poured into India in successive waves between the years of 714 and 1526 A.D. Their earliest attempts to establish a Muhammadan rule in India were not successful. Not till the time of Mahmud of Ghazni (1001–30) was a Muhammadan power established east of the Khyber Pass. Delhi was taken in 1206 by Kutab-uddin, who founded a dynasty, ruling over the greater part of Hindustan; and the Khilji dynasty (1290–1320) extended the Muhammadan power to southern India. Muhammad Tugluk, who belonged to the next Muhammadan line, has left a name which is a by-word of ferocity and cruel oppression. This dynasty was terminated by the invasion of the hordes of Tamerlane (Timur) in 1398. Altogether there were eight dynasties from that of Ghazni to the Moghul line founded by Baber, a descendant of Genghis Khan and of Timur, in 1526.

At the date of Baber's invasion there was an Afghan king ruling in Hindustan, and five independent Muhammadan States in the Dakhan—viz. Bijapur, Golconda, Ahmednagar, Berar, and Bidar

—besides a Hindu raja still holding sway at Vijayanagar in the far south. The Afghan house of Lodi was overthrown by Baber on the fateful field of Panipat. Baber's son, Humayun (1530–56), for a time lost the sovereignty won by his father, but recovered it in another battle at Panipat shortly before his death. He was succeeded by his son, Akbar the Great (1556–1605), who was the real founder and organiser of the Moghul Empire. Partly by force, partly by conciliation, he reduced the Muhammadan States of Hindustan and the Rajput princes under his sway, tolerating the Hindu religion and providing a career for the Rajput nobility. With the help of Raja Todar Mall, his minister of land revenue, and Abul Fazl, his minister of finance, who was also his historian, he reformed the whole public administration, as well in matters of revenue as of justice and police. He settled the land revenue of northern India according to Hindu customs, obtaining £17,500,000 sterling from this source, his whole income being estimated at £42,000,000 sterling. Akbar's son and successor was Jehangir (1605–28), whose Court was visited by Sir Thomas Roe, the first British ambassador to India. He was succeeded by his son Shah Jehan (1628–58), the builder of the most magnificent buildings in India, including the exquisite mausoleum of the Taj Mahal at Agra and the Great Mosque, or Jama Masjid, at Delhi. Before his death Shah Jehan had been superseded by his crafty, fanatical, and usurping son Aurungzeb (1658–1707), whose long reign saw the decline of the power of the Moghul Empire. Its strength was wasted in prolonged campaigns for the conquest of the independent kingdoms of the Dakhan and in vain efforts to check the growing power of the Mahrattas. After Aurungzeb's death the Moghul Empire was rapidly disintegrated. In 1738 Nadir Shah of Persia invaded India and sacked Delhi, slaying 100,000 of its inhabitants and carrying off, it is said, £50,000,000 sterling worth of treasure. By this time the Dakhan, Oudh, and Bengal had become practically independent, the former under the Nizam-ul-Mulk, the founder of the present house of Haidarabad.

The Mahrattas. It then seemed that the predominant position in India was to pass to the Mahrattas, whose power had been founded by Sivaji (1627–80), but was now led by the Peshwa, the prime minister who acted the part of mayor of the palace to Sivaji's successors at Poona. The Mahratta confederacy consisted of five chiefs, of which three are still represented by the Gaekwar in Baroda, Scindia in Gwalior, and Holkar in Indore, the other two—the Peshwa at Poona and the Bhonsla Raja at Nagpore—having been absorbed in the British dominion. The combined forces of these five powers, however, met with a crushing reverse at Panipat (1761) at the hands of the Muhammadans, under the Afghan Ahmad Shah Durani, from which they never recovered. It was a blessing to the country that the Mahrattas, and their successors the Pindaris, were finally subjugated by the British, as their system, if it may be so called, was one of organised plunder rather than of settled government.

European Rivalry. From time immemorial the most lucrative branch of the world's commerce has been that between Europe and India and the farther East. Centring in the Middle Ages at Constantinople, it was the mainstay of the Byzantine power. With the decadence of that Empire this trade passed to the Italian cities, and Venice then, it has been pointed out, literally "held the gorgeous East in fee." At the close of the 15th century the desire to share in this lucrative commerce began to lead the western nations of Europe to seek a route to India by the ocean. It was in an attempt to seek India in 1492 that Columbus discovered America for Spain; and five years later Vasco de Gama, who carried the Portuguese flag, succeeded in doubling the Cape of Good Hope and in reaching Calicut in 1498. Notwithstanding the hostility of the Arabs, who then monopolised the trade on the Indian coast, and of the Turks, who sought to retain the Indian commerce in its existing channels through Egypt and Asia, the Portuguese in a few years made themselves supreme in the Eastern seas, and enjoyed the commercial profits of their supremacy for a century. Their Eastern trade was a royal enterprise and monopoly, and with it they sought to combine the conquest and conversion of the country. But for this task their power was inadequate, though for a period, especially during the governorship of Albuquerque, their influence in India itself was considerable. All the possessions in India that now remain to Portugal are Goa, which was occupied in 1510, and Daman and Diu, with a total population of 561,384 persons. The Portuguese monopoly in the East was broken through, not without a struggle, by the Dutch and English at the beginning of the 17th century. From 1600 to 1700, though the English were eager rivals and the French made fitful attempts to share in the trade and conquests of the East Indies, the supremacy was held by the Dutch. In the Eastern Archipelago, where their principal establishments were located and their territorial conquests made, they succeeded in ejecting all their rivals. Of their possessions Java alone still remains to them, having been taken by England in 1810, but restored in 1814. After the decline of the power of Holland early in the 18th century, there remained only two formidable European competitors in the race for Indian commerce and Indian empire. These were the English and the French. The first English East India Company was incorporated on the 31st December, 1600. Two or three other companies were started at later dates, but the last of the rival companies was amalgamated with the original company in 1709. The early doings of the English East India Company include their successful sea-fight against the Portuguese off Swally, the port of Surat, in 1615; their expulsion from the Eastern Archipelago by the Dutch in 1624, the massacre of Amboyna having occurred in the previous year; the foundation of their settlement at Madras in 1639 and at Hugli in 1640. Surat had been founded at an earlier date, but the seat of the Western Presidency was in 1687 transferred from it to the island of Bombay, which had been ceded to England by Portugal in 1661 and was delivered to

the company four years later. As a Presidency settlement Hugli also gave place in 1688 to Calcutta, which is 24 miles lower down the same river.

The earlier French East India Companies, though partially successful in occupying the Mauritius and planting settlements in Madagascar, had failed to gain a footing on the continent of India. It was the fifth company, started by Colbert in 1664, which founded the settlements of Pondicherry in 1674 and Chandernagore in 1688. This was succeeded by a sixth company, established in 1719, which raised the French influence in India to its highest point and contested the Empire of India with the English. The failure of the French company in that contest was due to the want of steady support from home, to the absence of unanimity between their governors, commanders, and admirals, and to their inferiority in sea power. The contest was fought out between the years 1744 and 1761. The great French governor, Dupleix, was the first since the days of Portuguese ascendancy to deliberately conceive the project of establishing a European empire in India, and for a short period he succeeded in imposing French predominance upon the greater part of the peninsula. The incidents of the war between the French and English companies include the capture of Madras by the French in 1746; its surrender as one of the conditions of the treaty of Aix-la-Chapelle in 1748; the second outbreak of war in 1750, Clive's heroic defence of Arcot in the following year; the recall of Dupleix in 1756; the arrival of a large French force under Lally in 1759, his defeat in the following year by Colonel (Sir Eyre) Coote at Wandewash, and the capture of Pondicherry in 1761. As a shadow of their once predominant influence, the French still possess Pondicherry and one or two minor settlements, having a population of 282,923 souls (in 1890); but since 1761 they have not been a political power in India, though their intrigues with native chiefs have sometimes given trouble and anxiety to the British power.

Growth of the British Empire. During the progress of the contest between the two companies on the Coromandel coast the first step had been taken towards the acquisition of territorial dominion by the company in Bengal. In those days Bengal was nominally a province of the Moghul Empire. The last of its great Nawabs was Ali Vardi Khan, who died in 1756. He was succeeded by Siraj-ad-Daula (Surajah Dowlah), whose ungovernable temper led to a quarrel with the English company. He was responsible, after having captured Calcutta, for the tragedy of the Black Hole, in which so many of the English who had surrendered met with a cruel death. This took place in June, 1756. On receipt of the news at Madras, Clive and Admiral Watson repaired with a considerable force to Bengal, recovered Calcutta, and at the battle of Plassey (June 23, 1757) completely routed the Nawab's army. Though the immediate results of this battle were relatively small, its date is generally accepted as the date of the beginning of the British Empire in the East. When Clive, who had been Governor of Bengal from 1758 to 1760, left for England, disorder and corruption prevailed. Sums of money were exacted from the native rulers.

One Nawab, Mir Jafar, was replaced by another, Mir Kasim, who proved to be less complacent to the company than had been expected. A quarrel arose which led to the massacre of the English at Patna (1763) and to a war with both the Nawab of Bengal and the Nawab Wazir of Oudh. Major Munro's victory at Baxar (1764), however, broke down all opposition, and brought also the Moghul Emperor a suppliant to the English camp. Oudh was restored to the Nawab Wazir; Allahabad and Kora were given to the emperor, and the company received the *diwani* or fiscal administration of Bengal, Behar, and Orissa with the jurisdiction of the Circars. This was the beginning of the company's territorial dominion. Clive, who had returned to India for his second term as governor in time to effect this arrangement, also carried through, in the face of much opposition, the reorganisation and purification of the company's service. In 1772 Warren Hastings received the Governorship of Bengal. This office, the title of which was changed under the Regulating Act in 1774 to that of Governor-General, he held till 1785. During this long period of rule he brought the administration of the country under European officers, and created the administrative system on its existing lines. It was on his internal reforms, in regard to the collection of revenue and the courts of justice and police, that Warren Hastings prided himself. It is by his Rohilla War, and his treatment of the Raja of Benares and the Begum of Oudh that, thanks to the exaggerated declamations of orators and unfair judgments of historians, he is best remembered. Hampered in his domestic policy by the opposition of his own council, and forced to find remittances for his masters at home, he had to face the most serious combination of native powers ever opposed to the English in India, and to carry through distant and protracted wars for which his policy was not responsible. The Bombay Presidency, involved in a war with the Mahrattas in 1778, had to be saved from the consequences of their rash conduct by an army despatched from the other side of India, and with difficulty the *status quo ante* was re-established by a treaty with these enemies in 1782. It was during this period of stress that Haidar Ali, the Sultan of Mysore, burst unexpectedly as a thundercloud upon Madras, and the southern Presidency had also to be saved by another army marching from Bengal. Warren Hastings, who had thus preserved and even strengthened British dominion in India at a time when England was losing its colonies in America and barely holding its own upon the sea, was succeeded by Lord Cornwallis, the first peer and the first Parliamentary statesman who undertook the government of India. His first administration lasted from 1786 to 1793, and is remembered chiefly in connection with the second Mysore War (1790-92), and the permanent settlement of the land revenue in Bengal, which is described in a later paragraph. The Mysore War, in which Lord Cornwallis had the Nizam and the Mahrattas as allies, left Tipu Sultan, the son and successor of Haidar Ali, bereft of half his power and territory and full of resentment against the British power. Under Lord

Cornwallis criminal jurisdiction was for the first time entrusted to Europeans and a supreme court of criminal judicature established at Calcutta.

Lord Cornwallis was succeeded by Sir John Shore (Lord Teignmouth), who had been instrumental in elaborating the details of the permanent settlement, though not responsible for making them permanent. His rule (1793-98) was uneventful. He was followed by Lord Mornington (afterwards Marquess of Wellesley), who from 1798 to 1805 carried out a masterful policy. When he arrived in India, Napoleon was in Egypt, a correspondence was being conducted between the French and Tipu Sultan, and French adventurers officered and disciplined the armies of the Nizam and of Scindia. The Nizam's army was peaceably disbanded and replaced by troops under the command of British officers; the Mysore State was conquered and its usurping dynasty wiped out of existence by a campaign ending with the capture of Seringapatam and the death of Tipu Sultan (1799); the safety of Bengal to the north-west was secured by new financial and military arrangements with the loyal but decaying state of Oudh; the Madras Presidency was extended to almost its present limits by the annexation of the ill-governed territories of the Nawab of Arcot; in a series of brilliant campaigns the organised armies of Scindia were destroyed, and the Moghul Emperor at Delhi, who had long been a puppet in the hands of the Mahrattas, was by Lord Wellesley's measures brought into the custody of the British power, and as state pensioners of the English he and his successors continued till they came to a tragic termination in the days of the Sepoy Mutiny. His whole policy was directed to the establishment of British supremacy; and with that end in view he reduced and isolated the forces of the Native States, and bound the Chiefs to the British Government by a system of subsidiary alliances and of military contingents under British control. While free to exercise their proper internal authority, they were precluded from mutual aggression by the imposition of the supremacy and general protection of the British power.

Lord Wellesley's magnificent schemes exhausted the finances of the company, and alarmed the directors, who from the days of Clive had been averse to the extension of their dominions in the East. Lord Cornwallis was reappointed Governor-General (1805) to succeed Lord Wellesley, and to substitute for his schemes a policy of retrenchment and peace at any price. He died shortly afterwards, and his place was temporarily taken by the senior civil servant of the company, Sir George Barlow, till the arrival of the new Governor-General appointed in England, Lord Minto (1807-13). During this period the British Government sought to restrict its responsibilities and to withdraw from entanglements with the native powers. But, at the same time, the fears of French and Russian invasion led to the extension of Indian diplomacy to the Courts of the Punjab, Afghanistan, and Persia; and as incidents of the naval and colonial war against Napoleon the French were expelled from the Mauritius, and the Cape of Good Hope and Java were seized from the Dutch. Within India itself

the policy prevailed of reaction in foreign affairs and of consolidation in internal administration.

Lord Minto was succeeded (1814-23) by the Earl of Moira (Marquess of Hastings), who completed Lord Wellesley's schemes of conquest and carried into final effect his policy of establishing the supremacy of the British power in India. The policy of non-intervention had failed. The countries outside our pale were falling more and more into hopeless disorder and distress. According to all recognised Indian traditions, it was incumbent on the power which enjoyed the imperial position to perform the imperial obligations of imposing peace on the strong and protecting the weak. Lord Hastings' first measure was to stamp out the free-booting bands of the Pindaris, who were devastating almost every state in the centre of India. Having destroyed them, he settled the whole country by a series of permanent treaties of subordinate alliance with the various native chiefs. His campaign and treaties involved him in disputes with the Mahrattas, and the last Mahratta War ensued, which led to the annexation of the Peshwa's dominions to the presidency of Bombay. The only other event of importance in Lord Hastings' *régime* was the Nepal War (1814-15). The next Governor-General, Lord Amherst (1823-28), at a cost of £14,000,000 sterling and 20,000 lives, mostly victims to sickness, extracted from the King of Ava a treaty by which Burma gave up all claims to Assam and ceded the provinces of Arakan and Tenasserim. His successor was Lord William Bentinck (1828-35), whose rule was marked by reforms instead of wars. Besides restoring equilibrium to the finances, disordered by the Burmese War, he reformed the judicial administration, admitted educated natives more freely into the service of Government, fostered education, abolished the custom of *suttee* or widow-burning, and stamped out *thuggee*, a large and secret organisation for murder and robbery.

Freedom of the press in India was granted during the short temporary administration of Sir Charles (Lord) Metcalfe (1835-36), who was followed by Lord Auckland (1837-42), whose name is connected with the first Afghan War. Conceived as a measure to check the advance of Russia in Central Asia, it was undertaken, with the alliance of Ranjit Singh, ruler of the Punjab, to replace Shah Shujah on the Afghan throne. For two years success smiled on this daring adventure. Then came the catastrophe of the disastrous retreat of the British troops from Kabul in the winter of 1841-42. Kabul was indeed recaptured in the following autumn, but the attempt to retain Afghanistan was abandoned.

Before the close of the Afghan War Lord Auckland had been succeeded by Lord Ellenborough (1842-44), whose period of rule was signalled by the annexation of Sind after the defeat of the army of the Mirs by Sir Charles Napier. The abolition of slavery in British India was the result of a short law passed at this time. The next Governor-General, Sir Henry (Lord) Hardinge (1844-48), was brought into collision with the Sikhs. Ranjit Singh, the founder of the Sikh kingdom, had died in 1839, leaving no successor to maintain efficient control over his powerful army. This army was

beaten and driven back in four great battles, and peace, a short-lived one, was exacted at Lahore (1845).

The renewal of the contest with the Sikhs took place shortly after the arrival of the next, and perhaps the greatest, of the Indian Governors-General, Lord Dalhousie. During his term of office (1848-56) wars on the west and on the east added the Punjab and Lower Burma to British territory. In consequence of continued and irremediable misgovernment Oudh was formally annexed; and by the exercise of the right of lapse the territories of Berar, of Satara, of Tanjore, of Jhansi, and of other principalities, were absorbed into the British provinces. Lord Dalhousie's annexation policy was based on his firm conviction that British administration was better and more conducive to the happiness of the governed than native rule. Not satisfied with wars and annexations, Lord Dalhousie brought an ardour for reform into every branch of the administration. He founded the Public Works Department. He opened the Ganges Canal, still the largest of irrigation works, and not only inaugurated the railway system in India, but planned all its trunk lines. He promoted steam navigation with England *via* the Red Sea, and introduced cheap postage and the electric telegraph; but his greatest administrative achievement was the organised government which in so short a time he established, under a remarkable staff of officers, in the newly-annexed province of the Punjab.

All was peaceful when Lord Canning stepped into Lord Dalhousie's place in 1856; but his administration (1856-62) was shortly disturbed by the great Sepoy Mutiny, which broke out at Meerut on May 10th, 1857. Almost all the sepoy regiments of the Bengal army revolted, and most of the contingents maintained by the native states. Delhi was occupied by the mutineers, and Cawnpore surrendered to them, while the garrison at Lucknow with difficulty maintained their position till relieved by British reinforcements. The army by which Delhi was retaken was organised from the Punjab, which remained loyal under the strong rule of Sir John Lawrence and his coadjutors. Oudh and the North-West Provinces were reconquered by fresh troops marching from Calcutta under Sir Colin Campbell (Lord Clyde), and the mutineers in Central India were overthrown in a brilliant campaign conducted by Sir Hugh Rose (Lord Strathnairn).

Parliamentary History. The Mutiny was the death-blow of the East India Company. On several previous occasions Indian affairs had occupied the attention of Parliament. The first important compact between the Home Government and the company was in 1766, when the Ministry stepped in to regulate the commercial affairs of the company and to share in the wealth of the Indian kingdom which it had so suddenly acquired. Reports of misdoings of the company's servants, and disorder in its finances, led to the first great Parliamentary inquiry into the company's affairs and to the passing of the Regulating Act of 1773, under which Warren Hastings became the first Governor-General. In the proceedings connected with the

trial of Warren Hastings the affairs of the company were much discussed, and the responsibility of England for the welfare of the population, subject to the company's authority, was brought home to the public mind. At intervals of twenty years from 1793, the charter of the company was renewed. In 1813 its monopoly of Indian trade was abolished; in 1833 it was compelled to give up its China trade and devote itself wholly to the work of government. In 1853 its patronage was abolished, and the Indian Civil Service thrown open to public competition. In 1858, by the Act for the Better Government of India, the company itself was done away with. A proclamation, dated November 1st, 1858, which is often referred to as the Magna Charta of the Indian people, announced to the princes, chiefs, and people of India that Her Majesty had resolved to assume the government of the territories "heretofore administered in trust by the Honourable East India Company," and declared the principles of justice and religious toleration on which that government would be conducted.

British India under the Crown. The Governors-General under the Queen have been Lord Canning, Lord Elgin (1862-63), Lord Lawrence (1864-69), Lord Mayo (1869-72), Lord Northbrook (1872-76), Lord Lytton (1876-80), the Marquess of Ripon (1880-84), Lord Dufferin, afterwards the Marquess of Dufferin and Ava (1884-88), and the present Viceroy, the Marquess of Lansdowne (1888-93).

Since 1858 the only great direct acquisition of territory has been obtained by the annexation of the kingdom of Burma at the close of the Burmese War in 1885; the authority of the Indian Government has, however, been extended over the whole of Baluchistan, and consolidated over Kashmir and its northern dependencies up to the Hindu Kush. The Afghan War (1878-80), after vicissitudes of success and disaster, added permanently some small tracts of territory to the empire, and left Afghanistan internally independent, but as regards its foreign relations dependent on the British power. In virtue of this dependence, the northern boundary of Afghanistan from Persia to the Oxus was demarcated by an Anglo-Russian Commission (1885-86). The first half of this period has also been marked by terrible famines, the most severe in its limited area being that of Orissa (1866), the most prolonged and widespread that of southern India (1876-78). The period has also been distinguished by the vast extension of public works, especially railways, and by reforms in administration. Of these the most conspicuous are the decentralising measures adopted by Lord Mayo and extended by Lord Ripon, various rent laws for the better protection of the cultivators, especially in Bengal, Oudh, and the Punjab, and the recent extension of the popular element in the Legislative Councils. Hardly less important are the military measures that have been taken for the improvement of the army and for the defence of the north-west frontier, and the organisation for imperial defence of a portion of the military forces of the native chiefs, thus proving the solidarity of interest that exists between them and the British Government in India.

The Administrative System. The British ad-

ministration in India is based on the Act of 1858, "for the Better Government of India," by which the territories of the East India Company were transferred to the Crown. Since 1877 the Queen has assumed the additional title of "Empress of India." To one of Her Majesty's Principal Secretaries of State, aided by a Council appointed by the Crown, is entrusted the final authority in the government of India. The Secretary of State for India is a Cabinet Minister, whose tenure of office, therefore, is determined by the fate of the Ministry to which he belongs. The members of his Council, mostly retired civil and military officers of Indian experience, are not more than fifteen or less than ten in number, and are appointed for ten years, at the end of which they are sometimes reappointed for a further term. On questions of expenditure the Secretary of State requires the support of a majority of his Council, and in all ordinary matters he consults his Council, but not in matters of urgency and such as are of a "secret" nature. The Secretary of State's sanction is required in most questions affecting salaries of officials in India, and for all projects involving large outlay, for legislation, and for important changes of policy. In other administrative questions—the vast majority—the decision rests with the authorities in India, subject to control, review, or criticism by the Secretary of State in England. In India the supreme authority is "the Governor-General in Council." In this name all legislative enactments and administrative orders of the supreme authority in India are issued. The Viceroy, or Governor-General, who has in certain circumstances power to act independently of his Council, is appointed by the Crown, his tenure being ordinarily for five years.

His Council has two forms: a smaller body—the Executive Council—consisting of the Commander-in-Chief in India as an "extraordinary" member and of (usually) six "ordinary" members; and a larger body—the Legislative Council—consisting of these members, together with "additional members for making laws and regulations." The Executive Council meets frequently, and decides on all important questions of foreign policy and internal administration. The business of the Supreme Government is divided into the various departments of Finance and Commerce, Home Affairs, Revenue and Agriculture, Military Administration, Legislation, Public Works, and Foreign Affairs. Each department has its secretary and separate establishment, and is under the special care of an "ordinary" member of Council, who has authority to dispose of affairs of routine and of minor importance, and to select what is worthy of the consideration of the Governor-General in Council. The Governor-General himself specially superintends the business of the Foreign Department, which includes questions concerning the native feudatory states in India as well as what are more strictly foreign affairs.

The Legislative Council meets for the purposes of legislation and for the discussion of the Budget proposals, in connection with which members have also the power of putting questions to the Government, though not of carrying their opinions to a

vote. The Legislative Council includes the members of the Executive Council, the governor of the province in which the Council sits, certain officials selected by the Governor-General from the various provinces of India, and nominated non-official members, not fewer than ten or more than sixteen, representative of the native and European communities. The additional official members are not to exceed in number the non-official members.

There are Executive Councils of three members each in Madras and Bombay, and Local Legislative Councils similar to the above in Madras, Bombay, Bengal, and the North-West Provinces. Decentralisation is a characteristic of the existing British administration in India. Important financial, executive, and legislative powers are delegated to local authorities. Subordinate to the Supreme Government there are thirteen "Local Governments and Administrations." These vary in importance and in constitution, and in the degree of their dependence on the Supreme Government. Two—Madras and Bombay—are under Governors appointed by the Crown, assisted by Local Executive and Legislative Councils. They have separate local armies under local commanders-in-chief, which, however, are likely soon to be abolished, and they have in some minor matters the privilege of corresponding direct with the Secretary of State. Three—Bengal, the North-Western Provinces with Oudh, and the Punjab—are under Lieutenant-Governors, of which the two first have the aid of Local Legislative Councils. Three—Burma, the Central Provinces, and Assam—are under officers who are styled Chief Commissioners of those provinces. The remaining five—Berar, Ajmere-Merwara, Coorg, British Baluchistan, and the Andamans—are less important, and in the charge of Chief Commissioners directly subordinate to the Governor-General in Council. The last is little more than a penal settlement; the four others are small territories of which the administration is presided over *ex officio* by the Political Residents or Agents respectively in Haidarabad, Rajputana, Mysore, and Baluchistan, who have also the title of Chief Commissioner in respect of these territories which they directly administer.

In the administration of the various provinces of India there is a distinction, which used to be of greater importance than it is now, between "regulation" and "non-regulation" provinces or districts. The "regulations" were the old rules of law and practice adopted in the earliest acquired territories. They were found to be unsuited to many tracts subsequently acquired, especially to such as were of a more backward civilisation. In districts in which the regulations were not enforced, or non-regulation districts, the officials were less bound by rules of procedure, enjoyed larger powers combining fuller judicial with executive functions, exercised a wider discretion, and were more freely recruited from the military service. The real differences between "regulation" and "non-regulation" provinces tend to disappear. In name the difference is preserved by the title of the district officers, who in the former (*e.g.* Bengal, Madras, Bombay, and the North-Western Provinces) are called Collector-

Magistrates, and in the latter (*e.g.* Punjab, Burma, Oudh, Central Provinces, Assam, and Sind) Deputy-Commissioners.

In the whole of British India there are 250 districts. The district is the unit of administration. At its head is the Collector-Magistrate or Deputy-Commissioner, as the case may be. His duties are many and various. He is a magistrate, a judge in civil as well as criminal matters, a collector of the revenues imperial and local, and charged with the management or supervision of jails, police, education, municipalities, roads, public buildings, sanitation, and dispensaries. He must attend to the interests of all classes, and be acquainted with everything that goes on, and an adviser on every matter of public importance. Nothing is outside his province, because he is the representative of a paternal government. The districts being the separate units of administration, the force which maintains harmony among them and moulds them into uniformity is the Secretariat, the central bureau of each province, which receives the multifarious reports from every part, records them for future reference, and issues orders for the regulation of all details of administration.

The law administered by the British Indian courts consists partly of statutes of the British Parliament, partly of laws of the Indian legislatures, partly of Hindu and Muhammadan domestic laws and laws of inheritance, and partly of customary law affecting particular castes and races. It must be remembered that the British Indian legislatures have no power to make laws for territories of native states, which are all equally in this respect independent. Certain "scheduled" districts in British India, being mostly tracts very backward in civilisation, are also exempted from British Indian laws, unless these are specially applied to them by the Governor-General in Council in his executive capacity.

At the head of the administration of justice in the various provinces of India are the following courts, which are supreme both in civil and criminal business:—High Courts in Bengal, Madras, Bombay, and the North-Western Provinces, the court at Calcutta having jurisdiction also over Assam; a Chief Court of four judges in the Punjab; a Chief Court, consisting of two judicial commissioners, in Oudh; a judicial commissioner in the Central Provinces; two judicial commissioners and a recorder in Burma; while in the minor administrations the chief commissioner is himself also the Chief Court. An ultimate appeal lies from the courts of British India (as distinguished from the India of the native states) to the Judicial Committee of the Privy Council in England.

At this stage reference might be made to the table on page 4 showing the various provinces and groups of native states in India, with their areas and populations. It will be seen that most of the provincial governments have groups of native states subordinate to them, but that the larger and more important are directly subordinated to the Government of India.

The native states, of which there are nominally 800 in India, vary greatly in size, importance, and

degree of independence—from Haidarabad, which is as large as Italy and almost wholly free from interference in internal administration, to petty estates in Kathiawar, only a few square miles in area, of which the chiefs have often not even magisterial powers. The system of government in these states was originally of the usual Oriental type, arbitrary despotism tempered by the force of custom and the right of rebellion. The right of rebellion has now been withdrawn and replaced by the control of the paramount power, which, through its Political Residents and Agents, also exerts a constant pressure, stronger and more direct in some cases than in others, to induce the native chiefs to adopt and maintain regular and improved systems of administration of the kind in force in British India. In case of serious misgovernment, or of failure to listen to the advice of the representative of the paramount power, the native chief can be dethroned or his powers of government temporarily withdrawn. In even the most independent of these states the sovereignty is limited by the fact that they have no power either of making peace or war, or of having any sort of official relations with foreign powers or with one another, or of increasing their military establishments beyond certain limits.

Finance. The unit of currency in India is the rupee, which used to be approximately equal to 2s., but of which the value has lately fallen as low as 1s. 2½d. The accounts of British India are stated in tens of rupees, indicated by the symbol Rx. The difference between the position and functions of government in England and India is apparent on observing the most important items in the Indian Balance Sheet. Taking the accounts of 1891-92, the principal figures are :—

<i>Receipts.</i>					Rx.
Land revenue ...	...	...	...	...	23,965,774
Opium ...	...	...	...	...	8,012,380
Salt ...	...	...	...	...	8,636,182
Other taxation ...	...	...	...	...	16,636,170
Public works ...	...	...	...	...	22,837,210
Tribute and other receipts ..	...	...	...	...	9,055,567
Total ...	...	...	...	...	Rx. 89,143,283
<i>Expenditure.</i>					
Collection of revenues ...	...	...	...	...	7,760,949
Civil administration ...	...	...	...	...	13,853,842
Army ...	...	...	...	...	22,280,601
Interest ..	...	...	...	...	4,315,176
Public works ...	...	...	...	...	29,570,914
Famine and miscellaneous ...	...	...	...	...	10,894,266
Total ...	...	...	...	...	Rx. 88,675,748

The figures for land revenue, opium, and salt point to the fact that in India the State is the universal landlord, and a great manufacturer of salt and opium. It is, moreover, a great builder and constructor of railways, irrigation canals, and other public works. It also works profitably a large forest property, as well as a cheap postal and telegraph service, and incurs yearly expenditure, often inconsiderable but occasionally very heavy, in the relief of its subjects from famine.

The actual taxation—much of the revenue is not derived from taxes—falls on the population of British India at the rate of less than Rs. 2½, or (with the exchange 1s. 3d. the rupee) about 2s. 8d. a head.

The incidence of taxation is not only infinitely less than in England, but is lighter than in the India of Akbar's empire, and is lighter than it is at the present time in the native states of India, though these states have to bear but a small portion of the burden of imperial defence. The army, which absorbs more than half the net revenue of India, consists of about 72,000 British and 150,000 native troops. The difficulties and the cost of imperial defence have largely increased with the approach of the Russian Empire to the Indian frontier. The debt of India is relatively not very heavy. Deducting that portion which has been incurred for productive works, the national debt of India is about equal to one year's net revenue, say 40 to 50 million tens of rupees. The main difficulties of Indian finance are due to the fact that the Indian Exchequer receives its revenue in silver, and has to pay a part of its expenditure, 15 to 20 millions sterling, in gold, and with the fall in the gold value of silver, this part of its expenditure requires an increasing number of rupees. Other uncertainties of Indian finance are due to the opium revenue, which is of a commercial nature, depending on the Chinese demand, and to the possibilities of war and famine.

Land Revenue. "The subject of land administration in its widest sense comprehends not only the collection of the revenue, together with the elaborate process of assessing the revenue known as 'settlement,' but also the determination of the individuals or communities upon whom the assessment is levied, and to some extent a consideration of the tenure holders (if any) subordinate to these individuals or communities. The rent, or at least a considerable portion of the rent, is acknowledged by ancient custom to be due to the State, unless it happens to have been specifically surrendered in favour of some official personage or religious grantee. In such cases the land is known as *lakhiraj*, *inam*, or 'alienated'; but it is not the land, strictly speaking, that is alienated, but only the right to receive the Government share of the produce. Elsewhere the dominant claim of the State to exact its share is uncontested, though, as a matter of fact, it is exercised very differently in the different provinces. In ultimate resort, the land revenue must everywhere alike be paid by the actual cultivator of the soil, the *rayat*, petty tillage by peasants being universal throughout India. But for many reasons the State does not everywhere levy payment directly from the *rayat*. In some parts, as in Bengal, an intermediate class, half revenue agent, half feudal chief, called *zamindars*, were found in possession of the right of collecting the revenue from large tracts of country with the duty of paying it over, after certain deductions, to the State. By the measure known as the Permanent Settlement (1793) the revenue paid by the *zamindars* was fixed in perpetuity, while the *zamindars* were declared to be landlords, and the *rayats* gradually dropped to the position of their tenants. In the north-west provinces and the Punjab the village has always been the unit of revenue payment, whether the village be owned by one landlord or many, or by a joint community. The system in the central provinces combines features from

Bengal with features from the north-west. In Madras and Bombay, for the greater part, as well as in Assam and Burma, the settlement is *rayatwari*, recognising no one between the cultivator and the State."

Agriculture. Three-quarters of the population of India is agricultural, immediately dependent for their livelihood on the cultivation of the soil. Naturally the practice of agriculture shows infinite variety throughout the country. The seasons admit of two, and sometimes three harvests, in the year, but not necessarily, nor indeed usually, on the same fields. Agricultural statistics in the greater part of British India are fairly complete, but in Bengal they are wanting, because in that province, since the permanent settlement referred to above, the Government has not kept in touch with the local details of village cultivation. In two-thirds of British India, Bengal being excluded, the area devoted to food crops is about 130,500,000 acres, of which nearly 28,000,000 grow rice, over 20,000,000 grow wheat, and 76,500,000 millets, pulses, and other grain. Rather less than 24,000,000 acres are given over to the cultivation of other than food crops, of which the chief are cotton (10,750,000 acres) and oil-seeds (9,000,000). Rice is a crop requiring much moisture, and is grown most largely in Lower Burma, Lower Bengal, Assam, and the deltas of the Madras rivers. The great wheat-growing tract of India is the Punjab. Much of the exported wheat also comes from the North-West Provinces and the Central Provinces. The millets form the chief staple food of the Indian population, the principal varieties being the great millet (*joar* or *jawari*) and spiked millet (*bajra*). Of oil-seeds, the export of which has largely increased in late years, the four chief kinds are mustard or rape-seed, linseed, gingelly (*til*), and castor-oil. Vegetables and fruits of various kinds, spices, and palms are much cultivated. Sugar is an exhausting but often a lucrative crop. Of late years the manufacture of Indian sugar for export has much declined. Of non-food crops cotton holds the first place. The Indian variety has a short staple and cannot compete with American cotton for spinning the finer qualities of yarn. It is grown chiefly on the plains of Guzerat and Kathiawar, on the highlands of the Dakhan, and in the deep valleys of the Central Provinces and Berar. The cultivation of jute is confined to northern and eastern Bengal. Indigo is grown largely by European planters, chiefly in Behar, and by native cultivators in the North-West Provinces, the Punjab, and Madras. Opium cultivation is confined to the Ganges valley round Patna and Benares, and to the native states territories in central India. Tobacco is grown in every district for local consumption. Coffee culture exists in Coorg and Mysore, and other tracts on the eastern slopes of the Western Ghats, south of Kanara. The cultivation of tea is a comparatively recent introduction of European enterprise. The principal gardens are in Assam. They are to be found also on the Himalayan slopes, in Bengal near Darjeeling, in the North-Western Provinces in Kumaun and Garwhal, and in the Punjab in the Kangra district. There is also a small area under tea on the Nilgiris in Madras. The quinine-yielding cinchona was intro-

duced from Peru into India in 1860. Plantations have been successfully grown in the hills of southern and north-eastern India. Silk cultivation is a declining industry in India. Bullocks, cows, and buffaloes, with sheep and goats, form the chief agricultural stock throughout India. There are a considerable number of camels and horses also in the Punjab.

Irrigation. Much of the cultivation in India depends on irrigation, whether procured by indigenous works or from canals constructed by the British Indian Government. Some of these canals are the largest in the world. On their construction about 33½ millions (Rx.) have been spent, on which outlay the State receives a net return of 4 to 4½ per cent. per annum. The area irrigated by the Government canals is about 13,000,000 acres. Irrigation depends on three conditions: that there should be a constant supply of water, that the lie of the land should render it possible to conduct a part of this supply to the cultivated fields, and that the canal water should be a necessity, or at any rate a great advantage, to the cultivation. Where these conditions exist irrigation in India has been eminently successful. The most profitable systems are those which fertilise the deltaic systems on the Madras coast, and those in the Punjab and North-West Provinces which draw their supply from the great northern rivers as they issue from the Himalayan range. In Sind, too, irrigation has been very successful, the cultivation that there exists depending almost wholly on the inundation canals drawn from the flood waters of the Indus.

Famines. The famines of India have given the strongest stimulus to the Government in its irrigation policy. Several of these have occurred during British rule in India. In the famine of 1769-70 a third of the population of Bengal is said to have perished; in 1780-83 and 1790-92 southern India was afflicted; in 1838 the North-Western Provinces suffered. In more recent times occurred the Orissa famine of 1866, of short duration and in a limited area, but so severe that perhaps one-fourth of the population of Orissa died. This was followed in 1868-69 by a widespread scarcity over the North-West of India. In 1873-74 Behar and the North-Western Provinces were again threatened with severe famine. In 1876-78 occurred the widespread and prolonged famine, which was especially severe in southern India. Since that date there has been no serious scarcity.

Railways. Next to irrigation, the most useful means of combating famine are communications, especially railways. By the end of 1891 the railways in India had a length of 17,209 miles, constructed partly by companies enjoying a Government guarantee of interest, and partly by the State itself, at a cost of Rx. 219,615,655, and carried a traffic sufficient to return 5¾ per cent. on this capital outlay. The other principal means of communication are the roads which the British Government have been very active in extending in all the provinces, and the great navigable rivers, especially the Ganges, Brahmaputra, Indus, and Irawadi, and some of the Government canals, which have been made available for navigation as well as irrigation.

Trade. The extension of internal communications would have of itself given a great impetus to the sea-borne trade of India; but to this has been added the opening of the Suez Canal, the improvement and cheapening of navigation, the improvement of seaports, the abolition of almost all internal and external custom duties, and the increase of cultivation. At the same time new industries have been founded, mines opened, and new and valuable agricultural staples naturalised.

The domestic industries of India, such as weaving and spinning, pottery, brasswork, ironwork, and art-work of many kinds, continue to be practised all over India; but they tend to give way gradually where they come into competition with the cheaper cotton yarns and fabrics and the iron and steel products of British factories. At the same time the cheapness of Indian labour and the production of raw materials within easy reach have encouraged the establishment in India of steam-power factories for spinning and weaving cotton and jute, for making paper, husking and cleaning rice, sawing timber, and other industries. The cotton-mills, of which there are 125, mostly in Bombay, and the jute-mills, 26 in number, mostly in Bengal, are the most conspicuous outcome of this new spirit of industrial enterprise.

The rapid growth of the foreign trade of India appears from the following facts. In 1834 the trade was valued at about £10,000,000 sterling, in 1858 it had increased to £40,000,000, and in 1891-92 was valued at 108,250,000 (Rs.) of exports and 66,500,000 of imports. In the last twenty years the trade has doubled. By far the larger share of Indian trade, over 60 per cent., is conducted with the United Kingdom; China comes next with 13 per cent.; and France, the Straits Settlements, Egypt, Belgium, Germany, the United States, and other countries follow with decreasing shares. Of the shipping, 8,500,000 tons, by which this trade was carried in 1891-92, 83 per cent. flew the British flag. A characteristic of Indian trade is the large excess of exports over imports of merchandise, averaging 30,000,000 tens of rupees, of which a third to a half is covered by the net imports of gold and silver each year into India. The remainder of the balance of trade goes to pay for the interest on foreign capital invested in India and to meet the home charges of the Indian Government. Excluding treasure, the principal articles of foreign sea-borne trade may be seen from the following figures, stated in tens of rupees, relating to the year 1891-92:—

Imports into India (excluding Government stores).

Cotton manufactures	...	...	...	...	25,174,852
Metals	...	...	...	...	5,655,073
Cotton twist, and yarn	...	...	...	...	3,514,620
Oils	...	...	...	...	2,635,955
Sugar	...	...	...	...	2,561,996
Machinery	...	...	...	...	2,111,597

Exports from India (excluding re-exports).

Wheat	...	...	...	...	14,380,462
Rice	...	...	...	...	13,385,970
Seeds	...	...	...	...	12,208,458
Cotton	...	...	...	...	10,754,312
Opium	...	...	...	...	9,562,261
Cotton goods and twist	...	...	...	...	7,035,036
Jute	...	...	...	...	6,848,494

All imports are free, excepting arms and ammunition, opium, liquors, petroleum-oil, and salt. There is an export duty on rice; and export opium pays a monopoly profit, or an internal duty to Government, according as it is grown and manufactured in British India or in the native states. In other respects trade is free. The coasting trade of India is valued at nearly 70,000,000 tens of rupees, and the foreign land trade at about 8,250,000, a third of which is with Nepal.

Minerals. There is no great production of mineral wealth. There is plenty of iron-ore, which is worked in a small way by the natives, but with too great a waste of charcoal to make the industry profitable on a large scale. Ironworks on European methods have been opened in Bengal, but the difficulty of obtaining suitable coal, iron, and limestone in the same locality makes it unlikely that production of iron will ever be considerable in India. In regard to collieries the prospect is better. The production of Indian coal is steadily increasing, and now exceeds 2,000,000 tons a year. Salt is obtained in India partly by evaporation of seawater or of the water of inland salt lakes, and partly by mining or quarrying the solid salt of the Punjab Salt Range. A kindred mineral product is saltpetre, of which India has the only natural supply, but fiscal regulations for the protection of the salt revenue restrict its manufacture. Gold is to be found in small quantities in many parts of India. In recent years mining in the auriferous quartz reefs of southern India has been successfully undertaken, the production of gold amounting to half a million sterling a year. Copper is worked in the Himalaya region, and rich deposits of tin have been found in Burma. Burma also possesses the only supplies of petroleum-oil which have as yet been profitably worked in India. Other oil-beds exist in Assam and the Punjab and in Baluchistan. Ruby and jade mines exist and are worked in Upper Burma, but they have not as yet in English hands produced any great quantity of stones. Diamonds are still found in small quantities in some parts of India, but the old sources of supply in the Nizam's dominions seem to have been exhausted, or their wealth has been much exaggerated. Pearls are obtained off the Madras and Burma coasts, but the supply is not large.

Ethnology. In India the ethnical relations have been complicated not only by the intermingling of races and languages, as elsewhere, but also by the introduction at an early date of the institution of caste, with its various political, religious, and social bearings. Thus there are not only non-Aryan peoples, such as the Mahrattas and Uriyas, who now speak Aryan languages, but there are also non-Aryan peoples, such as the Namburi and Nayars of Malabar, who claim to be Brahmans and Kshatriyas, that is, members of the highest Aryan castes, reserved originally for the priestly and warrior classes. The original Kshatriya caste has, in fact, disappeared altogether, and the Rajputs, although now recognised as Kshatriyas by the Aryan Brahmans, appear to have reached India not earlier than the 4th century of the new era, probably 3,000 years after the arrival of the first Aryan in-

truders. It is also to be noticed that these intruders were not forbidden by the Vedic laws from intermarrying with the aborigines; the interdiction was introduced long after in the Brahmanic laws of Manu, when the caste system was invented to save the dominant Aryans from total absorption in the surrounding indigenous populations. Extensive interminglings had thus already taken place, so that caste, instead of being a safe test of racial purity, is really an additional element of confusion in the extremely intricate field of Indian ethnology.

So involved have the relations become, that nearly all attempts at a systematic classification of the inhabitants of the peninsula resolve themselves into a classification of their languages which, as seen, are no more trustworthy than caste itself as indications of racial origin. On this basis there are five very unequally distributed groups—that is, groups speaking dialects of radically distinct languages, three of which (*Dravidian* spoken by 63,000,000, *Kolarian* by 4,000,000, and *Khassi* by 200,000) are confined to the peninsula, while two (Aryan, 210,000,000, and Tibeto-Birman, 8,000,000) are common to other regions. It is natural to suppose that those speaking the three indigenous languages are themselves indigenous, or at least represent the aboriginal and earliest known sections of the population, and this to a large extent is the case. It is, however, to be noted that India appears to have been first occupied by none of these groups, but by a black, dwarfish race resembling the Negritos still surviving in the Philippines in the Malay Peninsula and in the Andaman Islands. This black element no longer forms anywhere a separate ethnical group speaking any primitive Negrito tongues, all of which have entirely disappeared. Nevertheless, it is still strongly represented by numerous low-caste or outcast mixed Negroid communities, chiefly of Kolarian or Dravidian, but also of Aryan speech. Such are the Maravars of the district of Madura and near Cape Comorin; the Veddhas also in the extreme south, akin to the Veddhas of Ceylon; the Kurumbas of the Nilghiri mountains; many of the Gonds on both sides of the Vindhya; the Khonds farther east, the Mundas of Chota-Nagpore, and many others, all dark enough to be called black, and little over 5 feet high, with black hair either lank or frizzly. All here mentioned are of Dravidian speech except the Khonds and Mundas, who speak Kolarian dialects. The Negritos were probably followed by the Kols, who give their name to the Kolarian linguistic group, and many of whom still retain their primitive Kolarian language. But the majority (all the Gonds and others) now speak Dravidian dialects, and are consequently classed with that division. The Kols entered India almost certainly from the north-east, and are now exclusively confined to the central uplands between the Ganges basin and the Dakhan. Then came the Dravidians, but still in extremely remote times, either, like the Kols, from the north-east, or more probably from the north-west, where they are still supposed to be represented by the Brahui of Baluchistan. At one time the Dravidians must have occupied almost the whole of India from the foot of the Himalayas to Ceylon; but by the intruding

Aryans they were partly exterminated or assimilated, partly driven from the plains of the Indus and Ganges southwards to the Vindhya and the Dakhan, which they still hold.

It is generally assumed that the Aryans, by whom the peopling of India was virtually completed, arrived from the north-west in a single body, settling first in the Punjab and thence moving slowly southwards to Rajputana and eastwards to the Ganges—movements which may be followed by the light of the Vedic poems, their oldest literary monument. But recent research has shown that there was not one, but several waves of Aryan emigration from the Iranian plateau to the peninsula. It may even be questioned whether the “Vedic Aryans” were the first arrivals; but in any case they were accompanied neither by the Jats nor by the Rajputs, who represent separate migratory movements, and who were both Aryan peoples, though not necessarily of Sanskritic speech. Sanskrit, however, in various Prakritic or vulgarised forms, ultimately became the exclusive language, not only of all these Aryan populations, but also of all the aborigines throughout the Indus and Ganges basins as far south as the Dravidian and Kolarian domains, and north to the slopes of the Himalayas. Here it became, and still is, conterminous with the domain of the Tibeto-Birman peoples, who have never advanced far into the Indian lowlands except in the extreme north-east (Assam), where they have been Aryanised. Sanskrit has also invaded the Dakhan, where some millions of Mahrattas, originally Dravidians, now speak a Gaurian (Neo-Sanskritic) tongue; it has even penetrated to Ceylon, where Singhalese, current in the southern half of the island, has been profoundly modified under Aryan influences. Altogether probably not more than one-third of the 210,000,000 classed as Aryans, because of their Aryan speech, are Aryans by descent, and even of these a large percentage show traces of interminglings with the aborigines. Most of the Brahman caste, the bulk of the Jats and Rajputs—regarded by some authorities as essentially the same people—and the Aryan-speaking inhabitants of Cashmere and Dardistan may be regarded as full-blood Aryans. But all the rest are either half-castes, or simply Aryanised Dravidians and Kolarians. Thus the outcome of the struggle between the two great conflicting elements is that India still remains mainly Dravidian ethnologically, while it has become mainly Aryan in speech and general culture. [Details under articles DRAVIDIANS, GAURIAN, JATS, KOLARIANS, RAJPUTS.]

Indians, AMERICAN, conventional name of the aborigines of the New World, so called by Columbus in the belief that on reaching the Antilles he had discovered India, and that the natives must consequently be “Indians.” There is a general consensus amongst the best modern ethnologists that these aborigines form a single more or less homogeneous division of mankind, having in common at least one physical feature—long, black, lank, and lustreless hair of the horse-tail type—and one mental feature—an order of speech best described as *polysynthetic*, that is, a tendency to merge the

various parts of the sentence in a single composite word of inordinate length. The physical feature they share with the Mongolic branch of the human family; the mental is peculiar to themselves, occurring in no linguistic group outside the American continent. Basque, the only fully incorporating language of the Old World, comes nearest to the American type; but the difference is still fundamental, for Basque incorporates only certain pronominal elements with the verb, whereas the American tongues embody the nominal as well as the pronominal subject and object, the capacity extending in principle to all the parts of speech. But despite this diversity, due to long isolation in the New World, the American Indians are generally regarded as an offshoot of the Mongolic race, which became detached from the Asiatic stock at an extremely remote epoch, probably before the two continents were separated by the present narrow and shallow waters of Behring Strait. Many groups both in North and South America—such as some of the Californian natives and the Botocudos of Brazil—still betray distinct Mongolic characteristics in their yellowish complexions, broad, flat features, and low stature. But the bulk of the aborigines depart from that type, especially in their prevailing reddish or coppery colour, shading off to dark brown on the Peruvian and Bolivian uplands, and even to a fair and almost whitish hue on the north-west seaboard; in their tall stature (Prairie Indians and Patagonians), in their large arched nose, receding forehead, and massive hatchet-shaped head, very full about the jaws, with a light prognathism.

These physical discrepancies are also reflected in the intellectual qualities and social relations, ranging from the absolutely savage and debased condition of the Fuegians, the Bolivian Chiquitos, and Californian "Diggers," through almost every grade of culture to the fairly civilised Arizonian Pueblos, Mexican Aztecs, Colombian Chibchas, and Peruvian Quichuas. The civilisations developed by these cultured peoples, with whom might perhaps be included the Mound-builders of the Mississippi Basin, the Veraguas of Central America, and certainly the Mayas of Yucatan, are often attributed to Chinese, Japanese, Buddhist, Egyptian, and other foreign sources. But the total absence of the useful plants (rice, wheat, barley, oats, rye) and domestic animals (ox, camel, horse, sheep, pig, dog, poultry) peculiar to the Old World, as well as of the Egyptian, Chinese, and other Oriental languages and writing systems, plainly shows that these peoples exercised no influence or never came in close contact with the civilised inhabitants of the New World, whose cultures must consequently be regarded as purely local developments. A stray Japanese junk, or Malay prau, stranded on the shores of the Pacific (for such arguments are appealed to), could explain nothing, seeing that the Pueblos were erecting their *casas grandes*, the Toltecs their truncated pyramids, the Mayas their elaborately-ornamented temples and palaces, long before the Japanese or Malays themselves were civilised enough to build craft capable of plying regularly on the South Seas.

Although cast in a common polysynthetic mould,

the American tongues have often very little else in common, and relatively to its population the New World presents far more radically distinct forms of speech—"stock languages" as they are called—than any other continental region, more perhaps than the whole of the Eastern Hemisphere together. Yet so great is the general uniformity of the physical type—as, for instance, throughout the boundless rolling plains of the Mississippi-Missouri basin—that Powell and other leading American ethnologists find language the most convenient basis of classification. Even a specialist will not undertake to distinguish off-hand an Iroquois from an Algonquin, a Dakota from a Kiowa. Yet these Prairie Indians, so like in outward appearance, speak each a different stock language. Some of these languages occupy a vast domain, while others are confined to quite narrow limits; and, speaking generally, the immense majority of the independent linguistic groups are in North America crowded together along the Pacific seaboard and on the Mexican plateau. In South America the classification is still far from being worked out; but it appears that here also the greater part of the territory is occupied by a few widespread families, while all the other numerous independent groups are confined to relatively small areas. The geographical position, tribal subdivisions, and other details are given under their respective entries.

From the West Indies the aborigines have disappeared, mainly exterminated by the first Spanish settlers and replaced by blacks from Africa. In Anglo-Saxon America (the Dominion of Canada and the United States), they never were numerous, probably not more than half a million at any time. Here they were either exterminated or repelled, or confined to reservations everywhere, except in parts of Canada, where some intermarried with the early French settlers, giving rise to a sturdy race of half-castes which persists. The full-blood Indians are diminishing, having fallen in Canada from 132,000 in 1881 to 121,600 in 1891, and in the States from 255,000 in 1880 to 246,000 in 1890; total in Anglo-Saxon America, estimated 1893, at about 364,000, of whom 30,000 in Alaska, 14,000 in Greenland and Labrador, the great bulk of the rest in Indian territory and other reservations. In Latin America (Mexico, Central and South America, except British Honduras, British and Dutch Guianas) the relations are totally different. Here the Spanish and Portuguese intruders almost everywhere amalgamated with the natives, producing a race of mestizos (half-breeds) estimated at about 30,000,000, and forming the dominant class everywhere, except in Costa Rica, Chili, the extreme south of Brazil, Uruguay, and parts of Argentina (Buenos Ayres, etc.), where alone the whites are in a majority. "In Spanish America the bulk of the population consists of Hispanified Indians" (Reclus. vol. xvii., p. 10, English edition). Even the full-blood Indians, who number altogether considerably over 2,000,000, form in some places the majority, as in Guatemala, where they are 60, the half-castes 38, and the whites only 2 per cent. of the population. In San Salvador also there are only 10,000 whites to 674,000 full-blood and half-caste aborigines. This process of

miscegenation has been disastrous to the higher races for the mestizos, while greatly improved in physique (many of the women especially are quite lovely), have retained some of the worst moral qualities of the Indians. Under a grave demeanour and apathy are often concealed fierce passions and a revengeful, lawless spirit, leading to great social disorders and constant political convulsions. It is this racial debasement that prevents the Spanish and Portuguese states from benefiting by their free democratic institutions, and which must ultimately give the absolute supremacy to the peoples of English speech, who have preserved their racial purity in the New World.

Indiarubber, the dried, coagulated, milky juice, or latex (q.v.), of various tropical trees and shrubs, belonging principally to the orders Euphorbiaceæ, Moraceæ, and Apocynaceæ. They occur principally within about 500 miles or 7° of the Equator, between the isotherms of 70° F., and where the annual rainfall is about 90 inches. The latex, which occurs chiefly in the inner bark, whence it is obtained by incisions, is an emulsion in which the rubber is suspended. The rubber, or caoutchouc, itself, when pure, is odourless, nearly white, elastic, having a specific gravity slightly exceeding .9, insoluble in water, alcohol, alkalies or unconcentrated acids, but soluble to some extent in benzole, ether, and volatile oils, or, more perfectly, in chloroform or carbon disulphide. It is believed to be a mixture of two substances both having a composition represented by $(C_{10}H_8)_x$ —one, fibrous and insoluble in benzole, merely swelling up into a paste; the other, the predominating constituent of inferior rubbers such as those of Guatemala and Africa, viscous and soluble.

The chief kinds of rubber are the South American, including the *Pará*, *Ceara*, *Pernambuco*, *Cartagena*, *Guayaquil*, and *Demerara*; the Central American, including the *West Indian*, *Guatemala*, and *Jamaica*; the African, including the *West African*, *Liberian*, *Mozambique*, and *Madagascar*; and the Asiatic, including *Assam*, *Rangoon*, *Singapore*, *Penang*, *Java*, *Borneo*, and *Fiji*.

Of these the *Pará* is by far the most important. It is the product of *Hevea* (formerly called *Siphonia*) *brasiliensis*, a much-branched euphorbiaceous tree, reaching 60 feet in height and bearing trefoil leaves, together with other species, growing in the rich alluvial clays of the Amazon valley. They have here a temperature reaching 89° to 94° F. at noon and never below 73° at night, and almost daily rain. The rubber is collected between August and February, each tree yielding about 6 ounces of juice, about 32 per cent. of which is rubber. The best quality is exported in flat, round cakes or "biscuits," which rarely contain more than 15 per cent. of moisture, whilst balls of less pure scrapings, known as "negro-head," often contain 25 to 35 per cent. of impurity. Through the agency of our gardens at Kew the *Pará* rubber has been successfully introduced into South Burma, Perak, and other colonies.

Ceara rubber is the product of another euphorbiaceous tree, *Manihot Glaziovii*, growing 30 feet

high, in a dry, stony region with a temperature from 82° to 90° F., in Rio Janeiro. From the mode of collecting, this rubber often contains 25 per cent. of impurities. The plant has been most successfully introduced from Kew into Ceylon, the Nilgiri Hills, Calcutta, and Zanzibar.

Pernambuco or *Mangabeira* rubber, a far less valuable kind, is the produce of the apocynaceous tree *Hancornia speciosa*. The *Cartagena* and *Guayaquil* rubbers are believed to be, at least in part, the produce of the large moraceous tree *Castilloa elastica*, which is also the chief source of the Central American rubbers. It grows in rich soil near streams throughout Southern Mexico, Central America, North-Western South America as far south as Chimborazo, in Cuba and in Hayti, and has now been successfully established in Ceylon. Most Central American rubber, of which that from Guatemala is very inferior, is exported to New York; but some of the best—that known as *West Indian*, though grown on the mainland—comes to England. *Demerara* rubber or *Macwarrieballi*, the product of the twining apocynaceous shrub *Forsteronia gracilis*, and *Jamaica* rubber, from the "Milk Vine," *F. floribunda*, though as yet little known, are likely to prove valuable.

The chief African rubbers are the produce of the apocynaceous lianas, belonging to the genus *Landolphia*. *L. ovariensis* occurs from Sierra Leone to the mouth of the Congo; *L. florida*, in Liberia, Angola, and even on the east coast; *L. Kirkii*, on the Zanzibar coast, yielding the best and most abundant rubber, the large trade in which is practically the work of Sir John Kirk during the last twenty years; and *L. Petersiana*, an inferior species, on the east coast. The finest Liberian rubber is the produce of *Ficus Vogelii*, and other species of fig no doubt yield some of the rubbers from both coasts. Some Senegambian rubber is the produce of the apocynaceous climber *Vahea senegalensis*, and Madagascar rubber, which is exported to France, is obtained from *V. madagascariensis*, *V. comorensis*, and *V. gummifera*. The allied *Willughbeia edulis* occurs in Madagascar, Mauritius, and Silhet. Assam rubber, at present the most important of those of Asia, is the product of *Ficus elastica*, which is so well known in the windows of London boarding-houses, requiring, as it does, but little attention. In its native country it enjoys a moist climate, with a shade temperature reaching 98° F. The tapping and collecting are very carelessly performed, so that there is often 35 per cent. of impurities; but the cultivation of the tree has been begun. Java rubber may be the produce of the same species; and that from Rangoon, of an allied form, *F. hispida*; but all the rubbers of the Malay Peninsula and of Borneo would seem to be obtained from various species of Apocynaceæ, such as *Willughbeia Burbidgei*, "Manungan pulau," *W. Treacheri*, "Bertabu," *Leuconotis eugenifolius*, "Manungan bujok," *Chilocarpus viridis*, and *C. flavesceus*. Fiji rubber comes from *Alstonia plumosa*, another member of this order, other species of which yield rubber in the Malay Archipelago.

The use of indiarubber by the natives of Hayti is mentioned by Herrera in his account of Columbus's

second voyage; but the trees were first described by La Condamine from Ecuador in 1735 and by Aublet from Cayenne in 1755. About 1770 Priestly, in a work on perspective, alludes to it as a new discovery for "wiping from paper the marks of a black-lead pencil." Not till the beginning of this century was it used in Europe for waterproofing fabrics, and the importation received an enormous stimulus about the middle of the century from the discovery that by combination with sulphur at a high temperature rubber may be hardened or "vulcanised." Over-vulcanisation with about 40 per cent. of sulphur produces "ebonite" (q.v.), and the admixture of vermilion produces the "dental rubber" used for making artificial gums. Seamless rubber tubing is now largely made by forcing the rubber through a die, or is moulded in powdered French chalk. Sheets of rubber are vulcanised between wet cloths, and retain an impression of them; but fabrics are "waterproofed" by a solution of rubber in benzol. So infinite are the applications of rubber in its various forms that it is, perhaps, hardly a matter of surprise that, in spite of the many plants and countries from which it is now obtained, the demand exceeds the supply, and we are anxiously seeking new sources of the raw material and an increased yield by careful cultivation and collection.

Indicator Diagrams, in steam- and gas-engines, are curves drawn mechanically, to show the varying pressure of the steam or gas in the working cylinder throughout the stroke. The instrument by which the curve is drawn is called the *indicator*; it was first employed by Watt, and has been of great value in testing the efficiency of engines and in pointing out defects of arrangement. It consists of a small, strong, hollow cylinder fitted with a piston. This has a piston-rod passing through a cover, and the lower end of the cylinder is put in communication with one end of the steam-cylinder itself by means of a brass or copper tube. Thus, the small piston is subjected on one side to the varying pressure of the steam in the main cylinder. To prevent its immediate passage to the end of its short stroke, the further side of the piston is fitted with a strong spring, of which the exact pressure requisite for each inch of compression is accurately determined. The end of the piston-rod thus jerks up and down with a motion corresponding exactly to the variations in steam-pressure during each stroke, excepting in so far as oscillations of the indicator spring mask the true movements required. Connected with the end of the piston-rod, and capable of magnifying its movements by means of suitable levers, is a small pencil of lead or other convenient material. It presses lightly against a drum, round which a sheet of paper is fixed; the drum is made to oscillate about its axis with a motion corresponding to that of the piston of the main cylinder. If the drum be disconnected from the engine, the recording pencil simply marks a vertical line in a jerky fashion. If the indicator cylinder be shut off from the engine and the drum be connected up therewith, the pencil marks a horizontal line round the paper on

the drum. If both mechanisms are connected up, the pencil draws a closed curve for each cycle of pressure-changes on the one side of the main piston. The area of the curve measures to scale the energy supplied by the expanding steam (or gas), and with a knowledge of the number of such strokes per minute the *indicated horse-power* of the engine is calculated.

Indicators, CHEMICAL, in volumetric analysis, are materials which are added to reacting substances to indicate when the reaction is completed. Thus, for example, if the quantity of alkali has to be estimated in a solution, a standard solution of acid is run in until the liquid becomes exactly neutralised, this point being ascertained by an indicator such as *litmus*, which, although of a blue colour in solutions of alkalies, turns red immediately in acid solutions, even though very dilute. The change in colour thus indicates the completion of the reaction, and from the quantity of acid added the quantity of the alkali present is known. Many substances are used as indicators, the mode of use being in all cases essentially similar.

Indices, in *algebra*, signify the power to which a number may be raised. Thus, the cube of a is expressed a^3 , 3 being the index. In the multiplication of two powers of the same number, the resultant power is obtained by adding the indices. Thus, $a^3 \times a^4 = a^7$, a result that may readily be proved. Similarly in the division of one such power by another, the resultant power is the difference between first and second, $a^7 \div a^3 = a^{7-3} = a^4$. From this is derived the rule that quantities with negative indices signify the reciprocals of the same quantities with the corresponding positive indices. Thus, $a^{-7} = \frac{1}{a^7}$ or $a^{-1} = \frac{1}{a}$. To raise a certain

power of a number to another power, the resultant power is given by the product of the first two. Thus, the cube of a^6 is a^{18} . From this is deduced the fact that any root of a given power is obtained by corresponding division of the index. The cube root of a^9 is a^3 , and the cube root of a , i.e. a^1 , is $a^{\frac{1}{3}}$. In this way a meaning is attached to fractional

indices. The value of $a^{\frac{5}{3}}$ would be the fifth power of the cube root of a . Finally to be consistent, the value of a^0 must be regarded as 1, whatever finite quantity a may be. For $a^m \div a^m = 1$; but $a^m \div a^m = a^{m-m} = a^0$. Hence $a^0 = 1$.

Indic Languages, an expression applied in philology to the Indian branch of the Aryan linguistic family, for which see GAURIAN, ARYAN.

Indictments, CLERKS OF, are officers attached to the Central Criminal Court and to each circuit. They prepare and settle indictments against offenders, and assist the Clerk of Arraignment.

Indigestion (dyspepsia) is a term applied to the group of symptoms consequent upon morbid conditions of the stomach (whether due to disease of that organ itself or produced as a secondary result of mischief affecting other parts of the body).

The term is sometimes restricted to those cases in which gastric symptoms appear to be associated with mere disturbance of the functions of the stomach, apart from any actual lesion or any definitely characterised organic disease. This latter use of the term includes instances in which the food is habitually swallowed without being properly masticated, or in which the amount of food is insufficient or excessive, or when it is of an indigestible character, or when the processes of digestion are interfered with as the result of hurried and irregular ingestion of food. The chief symptoms are a sense of fulness or sinking in the stomach, derangements of appetite, flatulence, nausea, and it may be actual vomiting. In some cases there is a frequent regurgitation of clear fluid from the stomach into the mouth; to this symptom the term *pyrosis* or *waterbrash* is applied. The treatment of indigestion consists mainly in regulating the times of taking food and the kinds of food taken. Attention to the habits of the patient, as regards exercise and the action of the bowels, is often required. Many drugs have been administered with a view to curing dyspepsia—carminatives, mineral acids, alkaline carbonates, vegetable bitters, and ferment substances among others.

Indigo, a valuable blue dye, known as an Indian product from the time of Dioscorides. It is obtained from the leguminous plant *Indigofera tinctoria*, and some allied species, grown in various parts of India, the Philippine Islands, Java, Egypt, Guatemala, Venezuela, Brazil, and Mexico. The plant is a herb, 3 to 5 feet high, with bi-pinnate leaves, and the best indigo—that from Bengal—is prepared from the fresh green stalks and leaves by a process of fermentation in water. The indigo forms a precipitate, and is dried into cakes by pressure. The colouring-matter of indigo, as also of woad (*Isatis tinctoria*) and of lan or Chinese indigo (*Polygonum tinctorium*), is a glucoside known as *indican*, which is decomposed by dilute acids yielding the neutral, tasteless, odourless, insoluble, deep blue *indigotin*, $C_{16}H_{10}N_2O_2$. Indigo is now largely prepared synthetically from cinnamic acid (q.v.), a coal-tar product. This, when acted upon by nitric acid, bromine, and caustic soda, yields nitro-propionic acid ($C_9H_5NO_4$), which, when printed on to cloth with glucose and alkali and steamed, develops indigo in the fabric. Our total imports of indigo in 1880 were about 2,920 tons; in 1890, 4,092 tons.

Indigo Bird (*Cyanospiza cyanea*), a North American finch, about 5 inches long, with deep blue plumage varied with ultramarine and green. The female is smaller and more soberly clad.

Indium (In. 113.4), a metallic element which occurs to a very small extent associated with zinc in the ores of that metal—*e.g.*, blende—and in which it was discovered by means of the spectroscope. It is a white, soft, malleable metal, melting at $176^\circ C.$, and possessing the specific gravity 7.4. It does not tarnish in air, and forms several series of metallic salts, its oxide having the formula In_2O_3 .

Indo-Chinese, collective name of all the south-eastern Asiatic peoples, except the Cambojans, Malays, and Negritoes, who belong ethnically to the Mongolic division of mankind, but who speak numerous languages belonging to a distinct order of speech usually called "Monosyllabic." The peculiar nature of this order has been explained in the article CHINESE LANGUAGE, a typical member of the group, the other chief branches of which are *Tibetan*, *Burmese*, *Talaing (Mon)*, *Thai*, including *Lao*, *Shan*, and *Siamese*; *Annamese* of Tonquin and Cochin-China; *Lohita*; *Naga*; *Si-fan*, *Lolo*, *Karen*, *Miao-tze*, and numerous other aborigines of China and Indo-China. For details see under the several entries.

Indo-Germanic, an expression formerly, and sometimes even still, employed, mainly by German writers, as synonymous with Aryan. But it has deservedly fallen into general disuse, being quite inadequate, inasmuch as it leaves out the *Iranic*, *Hellenic*, *Keltic*, *Italic*, and *Slavic* members of that family. [ARYAN RACES AND LANGUAGES.]

Indonesian, a term invented by Logan to designate the non-Malay inhabitants of the Eastern Archipelago, but now used as a convenient collective name for all the races of Malaysia and Polynesia who are neither Malays nor Papuans. Such are the Battaks of North Sumatra, many of the so-called Dyaks of Borneo, most of the natives of Jilolo (Halmahera), and the large brown race of East Polynesia (Samoans, Maori, Tongans, Tahitians, Marquesas Islanders, many Micronesians, and the Hawaiians). Dr. Hamy, who first gave this extension to the word, points out that the Battaks and other pre-Malay peoples of the Eastern Archipelago so closely resemble the Eastern Polynesians that the two groups should be regarded as two branches of an original non-Malay stock. Although all speak dialects of the common Malayo-Polynesian language, the physical type is quite distinct, and rather Caucasian than Mongolic—tall stature (5 feet 10 inches), muscular frame, dolichocephalous skull, rather oval features, high, open forehead, large, straight nose, large eyes horizontally slit, lips moderately projecting, beard often fairly developed, complexion much lighter than the Malay (light cinnamon), long black hair slightly curled or wavy. (Dr. E. T. Hamy, *Bulletin de la Société de Géographie*, xiii., 1877; A. H. Keane, *Relations of the Indo-Chinese and Oceanic Races*, 1880.)

Indore, the name of the state in Central India governed by a Maharajah having the title of Holkar; also of its capital. The total area is about 8,000 square miles, but the districts that go to make it up are scattered about the plateau of Malwa and the basin of the Nerbudda, the Vindhya range irregularly dividing the territory into two portions, of which the southern, watered by the Nerbudda, is the larger and more fertile, yielding wheat and other grains, sugar, cotton, tobacco, and great quantities of opium. Forests of wide extent are found on the Vindhya and Satpura hills. The population consists principally of Mahratta Hindus, and, in the less civilised parts, of primitive Bhils and Gonds.

A branch of the Great Indian Peninsula Railway extends to Indore, which is connected by another line with Nusirabad, Agra, and Delhi. The climate is hot and, after the rainy season, decidedly unhealthy. Education has made some progress, the Rajkumar College for sons of chiefs and nobles being an important institution. An agent of the Governor-General watches over the administration of this and the neighbouring states of Central India, having his headquarters at the capital, which stands on the left bank of the Kuthi, and is rather a poor city of brick and mud houses, with a granite palace for the Maharajah and a fine British Residency. The Holkar dynasty, founded at the close of the 18th century by Mulhar Rao, has been since 1843 under the virtual protection of the British, who placed the reigning sovereign on the throne, and who maintain strong garrisons at Mhow and Mahidpur.

Indra, in Hindu mythology, one of the chief gods of the Vedic triad, corresponding in many points to Zeus or Jupiter of classical theogonies. He personifies the firmament, is the lord of heaven, the giver of light and rain, the controller of storms and clouds. In later ages he passes into a less important position. He is generally represented as young and handsome, riding on an elephant, and he is often depicted as possessing numbers of eyes.

Indre, the name of a department, a river, and a town of France. The first covers an area of 2,624 square miles between the departments of Indre-et-Loire and Loire-et-Cher to the N., Cher to the E., Vienne and Indre-et-Loire to the W., and Creuse, Haute-Vienne, and Vienne to the S. Sloping from N. to S., the surface consists of a tableland only broken by hills at its lower extremity. Two-thirds of the country are covered with scattered woods, where cattle and horses are bred in numbers; but tillage only prospers in the river valleys. Fruit, beet, colza, potatoes, and garden produce are plentiful, but the vine does not thrive. Iron, limestone, marble, lithographic stone, and granite are worked profitably, and there are manufactories of paper, woollen fabrics, pottery, and tobacco. Châteauroux is the capital, Le Blanc, Issoudun, and Le Châtre being towns of some importance. The river from which it takes its name flows through the department from S.E. to N.W., receiving on its way the Creuse, Claise, and Vienne, and joining the Loire between Tours and Saumur. The town of Indre is situated in Loire-Inférieure, five miles W. of Nantes, and is only remarkable for extensive ironworks.

Indre-et-Loire, a department of France, bounded by Sarthe and Loire-et-Cher N., Maine-et-Loire W., Indre and Loire-et-Cher E., and Vienne S. and S.W. It has an area of 2,360 square miles, two-thirds of which are remarkably fertile. The Varenne, which includes the valleys of the Loire and Cher, and the Véron, lying between the Loire and Vienne, are the richest districts. The slopes of the Champeigne that separate the Cher from the Indre are noted for wine. The Gâtine, the Brenne, and the Sainte Maure have a less favourable reputation. The valley of the Loire is called "the

garden of France," and by its fertility, beauty, and climate deserves the title. Cereals, fruit (especially plums), vines, roots, hemp, nuts, and vegetables are produced abundantly. The *métayer* system does not, however, tend to promote agriculture. Good pastures are scarce. The mineral resources include iron, marble, building-stones, and marl, but do not add much to the general wealth. Pottery of good quality is made in various places, and the silkworm is cultivated with success. There are large gunpowder works at Ripant. Tours is the capital, and chief among many smaller towns are Chinon and Loches.

Induction, in *statical electricity*, signifies the appearance of electricity of one kind on the surface of separation of a dielectric and a conducting substance, when electricity of the opposite kind has been isolated. It is impossible to produce one without the other; when a charged body is introduced into a room, the inner walls have the opposite charge distributed over them, the density of the induced charge at any point depending upon the shape of the charged body, the intensity of its charge, its distance from the enclosure, and the shape of the enclosure. The dielectric between these opposite charges is in a stressed condition, for their tendency is to combine. When a rubbed piece of ebonite is held near a few shreds of light paper, the charge in the ebonite causes the induced charge in the neighbouring substances to be practically concentrated in the nearest of these, *i.e.* in the shreds of paper. The tendency of the opposite charges to unite will cause the paper to attach itself to the ebonite and so discharge itself. It then falls, the residual charge on the ebonite causes a further flow of electricity into the paper, and the process is repeated though with less vigour.

In *magnetism* the term has a somewhat different significance. The medium surrounding a magnet is in a strained condition, and at every point there is a definite direction of the resultant force; the existence of this force is not apparent unless a magnetic substance, such as iron, be brought to the given point. When any such substance is thus introduced into the medium, the lines of force are altered in direction, and the intensity of the force is changed. This rearrangement of the condition of the medium by reason of the introduction of a magnetic substance is called *magnetic induction*. [MAGNETISM.] In *electro-magnetism* it is found that variation in the arrangement of the lines of induction in the medium surrounding a magnet is capable of producing electric currents in any closed conducting circuits, through which the varying lines of induction may pass. If, for example, a bar magnet be thrust through a closed coil of wire, a current will be found to pass round the coil. The strength of this *induced* current depends on the number of windings in the coil, their diameter, and their resistance, on the strength of the inserted magnet, and the time taken to thrust it into the coil. Inasmuch as lines of induction may be produced by an electric circuit precisely similar to those produced by a magnet, it follows that variation in the strength of current flowing in one circuit

will cause intermittent currents to exhibit themselves in any neighbouring circuit. This fact has wide-reaching applications in modern electrical engineering. [DYNAMO-ELECTRICAL MACHINERY.]

The *Ruhmkorff* Induction Coil exhibits the action of one current on another very clearly. A low-resistance coil of few turns is wound round a core of soft iron, generally made up of a bundle of fine iron wires. Surrounding this, but entirely insulated electrically, is another coil of wire finer than the first, of many thousands of turns and much higher resistance in consequence. A current obtained from a few cells is sent through the low resistance or *primary* coil for a small fraction of a second and then stopped. This starting and stopping is rendered continuous by a trembler mechanism similar to that used in ordinary trembler electric bells (q.v.) for the same purpose. This variation in the current induces an alternation of potential in the high resistance or *secondary* circuit, in which the actual current strength will average much less than in the primary, but the intensity of potential much greater. [VACUUM TUBES.]

Indulines include a number of compounds all closely related to one another in their chemical characters and composition. They are employed as dyes yielding blue colours of great range of depth and shade, and are in the majority of cases rich in colour and stable compounds. Their exact chemical constitution has not, however, been certainly determined.

Indus, one of the largest rivers of India, rises in the Kailas Mountain among the Himalayas (32° N. lat. and 81° E. long.), where the Sutlej also has its source, and after a course of 1,800 miles, during which it descends 18,000 feet and drains an area of 373,000 square miles, falls into the Arabian Sea by several mouths S.E. of Karachi. It is first known as Sinhkabad, and, flowing N.W. past Ladak for 160 miles, enters Kashmir. The Hindu Kush range is passed at an altitude of 14,000 feet by the tremendous gorge of Iskardoh, and then, flowing S.W. through Kohistan, the river enters the Punjab at Derbend. Near Attock it is joined by the Cabul river, and from this point turns almost due S., parallel to the Suleiman range. At Mithunkote it receives the vast volume of water which the Panjnad has collected from the five rivers of the Punjab, and from this point its breadth is increased to 2,000 yards, or even to several miles in seasons of flood. It enters Sind at 28° 26' N. lat., and soon after spreads into several branches, the chief being to the W., where a delta of 3,000 square miles is formed. The Indus is shallow, the depth in places not exceeding 5 feet, and is much obstructed by sands and rocks, besides being liable to floods in March and September; but the navigation has of late years been vastly improved, and steamers ply regularly up to Sukkur.

Indusium, a luxuriant growth from the leaf in some ferns (q.v.), covering more or less completely the sorus or cluster of sporangia. In *Nephrodium* it is a kidney-shaped epidermal structure, but it may be several cells thick, and even have stomata.

In Hymenophyllæ it is a marginal cup-shaped structure, and in Lygodieæ a similar one envelops each separate sporangium. In many species of *Pteris* and other genera a *false indusium* is produced by the rolling back of the margin of the leaf.

Inertia, the property of all matter by reason of which it tends to remain in the same state of rest or motion. To alter the speed or the direction of motion of any mass requires, therefore, the exertion of force, and it is only by the recognition of the expenditure of force that we form our conception of inertia. [DYNAMICS, MATTER.]

Infanticide, the term used by anthropologists to denote the custom among races of low culture of destroying children as a means of lessening the severity of the struggle for existence. According to Darwin (*Descent of Man*, ch. xx.), wherever the practice prevails the struggle will be in so far less severe, and all the members of the tribe will have an almost equally good chance of rearing their few surviving children. In most cases a larger number of female than of male infants are destroyed, for it is obvious that the latter are of more value to the tribe, as they will, when grown up, aid in defending it, and support themselves. On the other hand, the custom has been attributed to a desire on the part of the women to retain their comeliness. Probably various motives led to the adoption of this custom; even religion may have had some share therein, as it undoubtedly had in the case of some of the hill tribes of India, and in many cases its perpetuation may have been due to the feeling—akin to that of some modern juries—that the killing of a child is a small crime in comparison with the killing of an adult. The exposure and killing of infants practised in classic times hardly comes under the head of infanticide as anthropologists understand the term; for though sometimes employed as a check to population, the object was usually to prevent the bringing up of sickly or malformed children. 'But in ancient Greece and Rome the father had absolute power over his children, and decided whether their lot should be freedom or slavery, life or death. Ellis records how prevalent the practice was when he arrived in Polynesia, and says that he could not find a woman who had not killed at least one child. In India the custom lingered till quite recent times, and its practice among the Todas having naturally led to polyandry, induced Colonel Marshall to come to the conclusion that the ancient Britons, who were undoubtedly polyandrous (*De Bello Gal.*, v. 14), were also infanticidal.

Infants. An infant is strictly one under 21 years of age, which is, generally speaking, the age of "legal capacity." In certain purposes, however, it is reached much earlier, for in criminal cases a person of the age of 14 years may be capitally punished, but under the age of 7 years he cannot. As to the intermediate period (that is, between these respective ages), there is much uncertainty, the accused being *primâ facie* innocent. Yet if he could discern between right and wrong, he may be convicted and undergo execution, though he had not attained the age of puberty or discretion. A

male at 12 years old may take the oath of allegiance, at 14 is so far at years of discretion that he may enter into a binding contract of marriage, and at 21 he is at his own disposal, may alien his property, and generally perform all the duties and enjoy all the privileges of a citizen. A female is of maturity when 12 years old, and may therefore at that age enter into a binding contract of marriage, and at 21 may dispose of her property. The full age of 21 years is completed on the day preceding the anniversary of anyone's birth, and as the law allows no fraction of a day in computing time, it follows that if an infant is born on the 1st of January, he or she is of age to perform any legal act on the morning of the last day in December, though he or she may have lived nearly 48 hours or two days short of the 21 years.

Infection. Certain diseases are transmissible from person to person, the healthy person being affected through the medium of some infective material or *contagium* given off from the sick. Such diseases are said to be infectious or contagious (the latter term being sometimes limited to cases in which the disease is transmitted by direct contact). The development of the germ theory has led to the notion that the essence of infection is a living organism, and in some instances it appears clear that such organisms have been demonstrated to exist, and the group of organisms known as *fission fungi*, popularly known as *bacteria*, has had particular attention directed to it in this connection. The means by which infection is conveyed are various; thus, the sputum of phthisical patients is probably largely responsible for the transmission of consumption. The scales of epidermis from the desquamating skin are supposed to be a medium of infection in scarlet fever. The breath is probably infective in measles, whooping cough, and other diseases; the mucus from the throat in diphtheria; and there can be little doubt that the excreta from the bowels are the means of conveying infection in cholera and typhoid fever. In some diseases infection is produced by inoculation only, *e.g.* vaccinia, and this is the common means of transmission in other diseases, such as anthrax. When infected material is conveyed into the body of a susceptible person, there ensues a period of incubation of variable length in different diseases, from a few hours or days in the case of diphtheria to as much as three weeks in mumps; in other diseases a yet longer incubative period obtains, and in cases of hydrophobia an incubation period extending even to months is said to occur.

The incubative period is succeeded by a period of invasion, usually accompanied by symptoms of fever; and in the case of the eruptive fevers or *exanthemata*, after a time fairly constant in the case of each particular disease, the characteristic rash appears. During the course of the illness the contagium undergoes development within the body, but after a time, unless death occurs, this development comes to an end, and the contagium is destroyed. It is usual to consider that a patient remains infectious for about three weeks after an attack of measles or diphtheria, and for six weeks

after scarlet fever. In some cases, however, these periods of contagiousness must be extended, as, for example, in cases of scarlet fever where desquamation is protracted. The Infectious Diseases Notification Act of 1889 is now in force in most parts of the country, and requires the notification of small-pox, cholera, diphtheria, membranous croup, erysipelas, scarlet fever, typhus, enteric (or typhoid fever), continued fever, relapsing fever, and puerperal fever. Power is given to a sanitary authority, with the sanction of the Local Government Board, to include any other infectious disease within the scope of the Act.

Infinitesimal Calculus, the branch of mathematics that deals with infinitely small quantities. Its chief divisions are the differential and integral calculus. [CALCULUS.]

Infinity, in *mathematics* (represented by the sign ∞), is a most difficult conception, and if used carelessly is liable to lead to fallacies. Numerically infinity signifies not one number but any number too great to be appreciated directly or indirectly by any means at our disposal. If $ab = ac$, it is usual to infer that $b = c$, but this is not the case if $a = \infty$; for, so far as our senses can distinguish, there is no difference between different multiples of infinity. Similarly, in geometry, an infinitely distant point means such a one as cannot be compared in position with any point in finite space. Two lines are called parallel when they are in the same plane, and when no amount of continuation of the lines will bring them together. Yet if they actually met at an infinitely distant point, they would still be parallel through the range of finite space. A circle of infinitely large radius would coincide with a straight line, from which the idea springs that if we could travel along a straight line sufficiently far we should return to the starting point.

Inflammation is the reaction manifested by the tissues to injury. The classical signs of inflammation are redness, swelling, heat, and pain. The arteries supplying an inflamed part dilate, and the flow of blood in them is retarded; fluid escapes from the capillaries involved in the inflammatory processes. [EXUDATION FLUID.] White blood corpuscles make their way through the capillary walls, and proliferation of these cells or of the connective tissue cells of the affected parts occurs. Such formation of new cells, if excessive, may result in suppuration, or the formation of pus, the pus corpuscles being the degenerate descendants of proliferating cells. Inflammation may terminate in resolution with absorption of the inflammatory products, or such resolution may be complicated by suppuration and the formation of abscesses, or by ulceration where the parts affected lie superficially. When the inflammation is severe, it may involve the death of considerable portions of tissue (gangrene or necrosis). The cause of inflammation may be some mechanical injury, or the introduction of some chemical irritant, or an infective agent or organism.

Inflorescence, a special region of the plant among seed-bearing plants, which bears the flowers

and has a special method of branching of its own. It generally also bears special leaves, besides those within the flower, which are known as *bracts* (q.v.). If these are absent, as in the *Cruciferae* (q.v.), the inflorescence is termed *ebracteate*. The branch or axis bearing a whole inflorescence is termed a *peduncle*, which may be unbranched, as in the tulip. If branched, its branches are known as *secondary* or *tertiary peduncles*, etc.; but the ultimate branches that terminate in the flowers are called *pedicels*. An inflorescence rising direct from an underground stem with few or no leaves upon it is termed a *scape* (q.v.), as in the tulip, hyacinth, or *Primula*. Inflorescences of more than one flower are divided into three classes, according to the order in which their flower-buds develop—viz., *racemose* or *indefinite*, *cymose* or *definite*, and *mixed*. [BRANCHING.] In the first class the lower or outer flowers open first; the terminal bud last. In the second class the terminal bud or centre flower opens first. In a mixed inflorescence one order of branching is racemose in its development and another cymose—e.g. the primary branches of one type, the secondary ones of the other. If the peduncle only bears one order of branches, the inflorescence is termed *simple*; if more than one, *compound*. Compound inflorescences may be *homogeneous*, if their secondary system of branching is precisely like the primary—e.g. a spike of spikes or an umbel of umbels; or *heterogeneous*, when, though belonging to the same main class (and therefore not “mixed”), the two systems are unlike—e.g. an umbel of spikes. Racemose inflorescences may have their main axis or peduncle either elongated or arrested, and in either case the individual flowers may be sessile or stalked (*pedicellate*). This gives us four main types—the *spike* (q.v.), with elongated axis and sessile flowers; the *raceme* (q.v.), with elongated axis and pedicellate flowers; the *capitulum* (q.v.) or “head,” with an abbreviated peduncle and sessile flowers; and the *umbel* (q.v.), with abbreviated peduncle but pedicellate flowers. Nearly all definite inflorescences are termed *eymes* (q.v.), and most of the chief modifications of the inflorescence, such as the catkin, spadix, corymb, and panicle, in addition to those already mentioned, are separately described. Mixed inflorescences are more complex. That of the horse-chestnut is a *raceme of eicinal eymes*, the primary branching being racemose, the secondary cicinal. In many *Labiatae* we have a *spike of verticillasters*; in chicory, a *bostrychoid eyme of capitula*; and in *Cineraria*, a *corymbose eyme of capitula*.

Influence Machines, in *electricity*, are machines for the separation of electricity on a large scale. The best known is the Wimshurst machine, which works on the principle of electric induction. It consists of two circular plates of glass or ebonite placed close together and made to rotate in opposite directions on the same axis. On the outer face of each plate small radial discs of tinfoil are fixed, in number from ten to eighteen usually. Tracing the course of one such disc suffices to explain the course of all. It has at one moment a small positive charge, and induces a negative charge on the

disc facing it and passing round on the opposite plate in the reverse direction. After performing this induction the given disc discharges itself into one receiver by means of a small metallic brush, and, travelling round further, is charged negatively by induction from a disc on the other plate. It then does duty in acting inductively for the production of a positive charge, and is then discharged into a receiver that collects the negative charges. Being then charged positively, it is in the primary condition of the cycle of changes, and the process is repeated. Positive charges accumulate on one receiver, and negative charges on the other. [ELECTRICITY.]

Influenza is an infectious disease, in which catarrh of the respiratory mucous membranes is a marked symptom. It is developed in epidemic form from time to time, attacking a large proportion of the population, and producing a marked influence upon the death-rate. Since the registration of deaths was systematically undertaken in this country, no year has passed in which deaths from influenza have not been recorded; but the disease in its epidemic form has occurred only two or three times. There was an outbreak in 1837–38, again in 1847–48, and once more in 1889–90–91. Little is known about the causation of the malady; it is highly infectious, and is presumably a germ disease. The symptoms are prostration, with severe frontal headache, and pains in the back and limbs; there may be considerable elevation of temperature, and pain in the eyeballs is often a characteristic early symptom. After a short interval the mucous membranes of the respiratory tract become involved, with sneezing, sore throat, bronchitis, or even pneumonia. The disease is usually at its height on the third day, convalescence is frequently protracted, and complications are not uncommon. The percentage of deaths is small, but so many people are attacked that not a few fatal cases occur. During epidemics the number of deaths recorded from diseases of the respiratory organs is materially augmented. Adult males are particularly liable to be attacked by influenza and to suffer severely; but the disease is chiefly fatal in the case of old persons, especially in those who are the subjects of chronic lung mischief. The treatment is that of febrile maladies generally. The remarkable prostration seems to indicate the desirability of adopting a liberal regimen. It cannot be too strongly insisted upon that there is danger in endeavouring to disregard this disease. Many deaths have occurred in persons who refuse to “lie up” and adopt reasonable precautions.

In Formâ Pauperis. Anyone may now be admitted to sue or defend as a pauper on proof that he or she is not worth £25 apart from clothes and the subject-matter of the action; but a case must first be laid before counsel for his opinion, whether or not there are reasonable grounds for proceeding, and the case and opinion, with an affidavit by the party or his solicitor of the truth of the facts stated, must be produced to the court. When admitted to sue or defend as a pauper, the court may assign him, if necessary, a counsel, a

solicitor, or both, who may not refuse without good reason, and are bound to act gratis.

Information, CRIMINAL, is a complaint exhibited before the Queen's Bench Division of the High Court of Justice against anyone for some misdemeanour. It differs from an indictment mainly in that the latter is found by the oath of a grand jury, whereas an information is simply the allegation of the person exhibiting it. Informations are of two kinds—(1) those partly at the suit of the sovereign and partly at that of a subject; and (2) those which are in the name of the sovereign only and are filed by his own immediate officer, the Attorney-General. Informations of the former kind are usually exhibited under penal statutes, which impose some penalty on the offender should he be convicted (one part of which goes to the sovereign, the other to the informer).

Infruitescence or INFRUCTESCENCE, a botanical term bearing the same relation to fruit (q.v.) as inflorescence (q.v.) does to flower. It is especially applied to structures in which the fruits produced by several flowers (generally a whole inflorescence) are closely united, often together with peduncular or other structures which are at all events not gynæcial. In the mulberry tree (q.v.) the perianth-leaves become fleshy, enclose the small dry capsule, and, touching those of the other flowers, a whole raceme forms one berry-like infruitescence. In the fig (q.v.) we have a hollow urn-shaped capitulum (q.v.) with a fleshy peduncle, which becomes sweet and ripens like a fruit and encloses numerous florets succeeded by round capsules, the "pips." The pine-apple is mainly a fleshy branch surmounted by a tuft of leaves, and having the dried-up perianth-leaves of numerous spirally arranged flowers on its outer surface. These are among the most striking examples.

Infusions, preparations obtained by steeping vegetable substances usually in hot water and straining, the heat in no case being allowed to reach the boiling-point, as is the case with decoctions. The pharmacopœia contains infusions made from calumba, cinchona, gentian, kusso, quassia, and other substances.

Infusoria, a class of Protozoa (q.v.) which includes the most specialised members of this phylum. The class is characterised by having a stable outline, as they do not emit pseudopodia (cf. *Amœba*), but have a more or less complete investment of the small vibratile processes known as cilia. They usually have a mouth (cytostome) and an anus (cytopyge). The body is often divided into two layers—the exoplasm (or cortex) and endoplasm (or medulla). A contractile vacuole (q.v.) is nearly always present. The nucleus is either single or multiple. They are mostly microscopic in size, but the compound forms may be fairly large. They are nearly all free-swimming, and live in either salt or fresh water; a few live in a small gelatinous tube or lorica, while others are attached by small pseudopodial processes (e.g. *Stentor*). The only skeletal structures known are that the lorica of some species contains particles of

silica (as in *Cordinella*), while in a few it is more specialised, consisting of a siliceous tube perforated by minute pores, which give it a radiolarian (q.v.) aspect. There are four orders of Infusoria, mainly characterised by the disposition of the cilia. They are—(1) Holotricha, in which the cilia are of the same form and occur in parallel lines; (2) Heterotricha, in which there is an investment of fine cilia, while there is also one band of larger processes known as "membranellæ," which are formed of many fused cilia; (3) Hypotricha, in which the cilia occur only on the ventral side; and (4) Peritricha, in which there is one band of membranellæ, but (with the exception of *Trichodinopsis*) there are no cilia. The Infusoria occur in great abundance in most rivers, ponds, and the sea, but they are only doubtfully known in a fossil condition. It should be remembered that the term Infusoria is often used in a more general sense to include also all the Mastigophora (q.v.).

Ingelow, MISS JEAN, was born at Boston, Lincolnshire, in 1820. In 1850 she published anonymously *A Rhyming Chronicle of Incidents and Feelings*, and in 1851 followed a narrative poem, *Allerton and Dreux*. Her first success was with a volume of verses published in 1863, and since then she has issued several volumes, which have run through many editions. Towards 1865 she began to write simple stories for children, and her *Home Thoughts and Home Scenes*, *Mopsa the Fairy*, *Little Wonderhorn*, and *Story of Doom*, have found much favour. Still later she has produced several novels of high merit, *Off the Skelligs*, *Fated to be Free*, *Don John*, and *Sarah de Berenger* being the best known.

Ingemann, BERNHARD SEVERIN, was born at Torkildstrup, Denmark, in 1789, and was being educated at the university of Copenhagen when the bombardment of 1806 took place, and his boyish compositions perished in the flames. However, in 1811 he produced a volume of poems, and repeated the experiment with success in the two following years. His cyclical romance, *The Black Knight* (1814), established his reputation, and he next made an essay in the drama with *Masaniello*, *Bianca*, *The Voice in the Desert*, and *The Shepherd of Toluca*. His fame, however, rests mainly on his historical novels, *Valdemar Seier*, *Erik Menred's Childhood*, *King Erik*, *Prince Otto of Denmark*, and many others, modelled upon the example of Scott. He was appointed professor of literature, and subsequently director of Sörö College, and died in 1862.

Ingleby, CLEMENT MANSFIELD, born at Edgbaston, Birmingham, in 1823, graduated at Trinity College, Cambridge, and became a solicitor. His reputation rests upon his labours as a Shakespearian scholar, as testified by about a dozen works, beginning with *The Shakespeare Fabrications* in 1859, and ending with an edition of *Cymbeline* published in the year of his death, 1886. One of the best known of his volumes is entitled *Shakespearian Hermeneutics*. He was a trustee of Shakespeare's birthplace, a vice-president of the New Shakespeare Society, and an honorary member of the Shakespeare Society of Weimar.

Ingolstadt, or INGOLDSTADT (ancient AUREA-TUM or CHRYSOPOLIS), is a fortified town in Upper Bavaria on the left bank of the Danube, about fifty miles north of Munich. Starting as a royal villa in the 9th century, the place received a charter in 1312, and became the capital of a dukedom, which subsequently fell to the Bavarian Crown. The fortifications built in the 16th century stood many assaults, in one of which, led by Gustavus Adolphus, Tilly was killed. Moreau razed the defences to the ground in 1800, but they have since been reconstructed on the scale of a first-class fortress. The streets are well laid out, and there are, besides the usual institutions of a provincial capital, the Gothic Dome founded in 1425, the old ducal castle, and the buildings of the university now transferred to Munich.

Ingres, JEAN DOMINIQUE AUGUSTE, was born at Montauban in 1780, and as a child showed great musical capabilities, but at the age of twelve developed a still stronger taste for painting. David took him as a pupil, and in 1801 he carried off the *Grand Prix*. *The Bather*, one of his best works, was produced in 1802, and he executed fine portraits of Napoleon both as First Consul and Emperor. From 1804 to 1824 he lived in Rome or Florence, and to this period belong his *Œdipus and the Sphinx*, *Jupiter and Thetis*, *Virgil Reading the Æneid*, *Raphael and the Fornarina*, *Death of Leonardo*, *Grande Odalisque*, and many other fine paintings, including portraits. His genius, however, standing as it did half-way between the classical and romantic schools, was not fully recognised in France until 1824, when *The Vow of Louis XIII.* obtained his election to the Institute. He now returned to Paris, but went back to Rome as director of the French school there after ten years. Several fine works, but especially the *Stratonice*, won him so much praise that he came home once more in 1841, and continued to work till the day of his death in 1867.

Ingulph, or INGULPHUS, born about 1030 of English parents, entered a monastic order, and having become secretary to William the Conqueror before his invasion of England settled in Normandy. In 1085 he was brought over to take charge of the Abbey of Croyland, where he remained until his death in 1109, doing much to enlarge and improve the foundation. The *Historia Monasterii Croylandensis*, once believed to have been his work, is now generally attributed to a later scribe, and its historical value has much depreciated.

Inhabited-House Duty comes under the denomination of "assessed taxes," and is a duty assessed and imposed upon persons in respect of the houses they inhabit. It is usually collected with the income-tax.

Inia (*Inia geoffrensis*), the Amazon Dolphin, a toothed cetacean of the family Platanistidæ, and the sole species of its genus. It is about eight feet long, bluish above, pale flesh colour below, and is found in the Amazon and its tributaries.

Injector, in engineering, is a contrivance for forcing a liquid through an orifice by means of the

flow of another stream of fluid through a small jet concentric with the orifice. The most ingenious is Giffard's injector for pumping water into a steam boiler by means of a jet of steam from the same boiler. Though it would at first seem impossible for the steam to overcome the opposing pressure of the water from the same boiler, the paradox disappears when the fact is considered that the steam is condensed into water at the jet. The energy thus liberated is converted into kinetic energy of the fluid through the jet, and outflow of the boiler water is prevented.

Ink. The term "ink" may be applied to any liquid which can be employed for writing upon paper or other fabric, leaving after drying a more or less permanent and indelible record. Such liquids have been used for many centuries, but accurate information regarding the composition of ancient inks is but scanty, so that little is definitely known. They were probably, however, similar to our present Indian ink. It is convenient to divide inks into those employed for *writing* and those used for *printing*. Of the former black is the colour chiefly used, and the ordinary black writing-ink is composed essentially of a compound of *iron* and *gallic acid*, which is held in suspension in a thin gum solution. It is prepared by thoroughly macerating *nutgalls* with hot water and then adding to the decoction a solution of *copperas*, together with the quantity of gum necessary to give the liquid the required consistency. As proportions the following may be taken:—Nutmalls, 12 lb.; copperas, 5 lb.; Senegal gum, 5 lb.; water to 12 gallons. In many inks *logwood* or *indigo* is also added, the latter being used in most of the blue-black inks, which, though blue at first, quickly dry to a deep black colour. Other materials have been employed and different inks produced not containing the above materials, but have enjoyed little popularity. For *red ink* a decoction of *Brazil wood*, to which a small quantity of chloride of tin has been added, is usually employed. Solutions of *cochineal* or of *carmine* may also be used, but the writing with these compounds is not of as permanent a nature as with the former substance. *Blue ink* is best made by dissolving Prussian blue in a solution of oxalic acid, the pigment being first purified by treatment with a mineral acid—*e.g.* hydrochloric acid. Inks of other colours may also be prepared by the use of suitable dyes, the so-called aniline colours being well adapted for the purpose. *Copying-inks*, by means of which copies of the writing may be taken on a damp sheet of paper pressed upon it, are prepared from ordinary writing-inks by the addition of sugar, gum, or other such substance. *Marking-ink*, used for production on linen of writing which can withstand washing, is usually prepared by the solution of the nitrate or tartrate of silver in ammonia, together with a little gum to give consistency. A colouring material is also usually added, but the indelible writing is entirely due to the decomposition of the silver salt. Numerous chemicals are also employed for the formation of *sympathetic inks*, in which the characters only become visible after the application of some process

to the writing. Thus a solution of sugar of lead (lead acetate) yields writing which becomes visible if treated with sulphuretted hydrogen. By use of solutions of cobalt salts, drawings, etc., may be obtained in which the markings, etc., become green on warming, but again invisible on cooling; and these compounds are used in production of the so-called chameleon pictures. A solution of nutgalls, if used as ink, becomes visible if treated with a solution of copperas, and many other means may be adopted for similar purposes. *Printing-inks*, not being used in the same manner as writing-inks, require totally different properties. Thus, while they do not require to flow as easily, they should dry more rapidly, and not be affected, or to but a small extent, by water, etc. What is found best adapted for printing purposes is a thick, drying oil into which is thoroughly mixed lampblack, or, if coloured inks are desired, any other permanent pigment. The oil usually employed is linseed oil. It is first boiled and allowed partially to burn; sliced soap and a quantity of powdered resin are added and well stirred, after which the still warm liquid is poured over the lampblack, to which a little indigo may be added, and thoroughly stirred and mixed before being allowed to cool. For coloured printing-inks the manufacture is essentially similar, but other pigments, as vermilion, Prussian blue, yellow ochre, etc., are employed. *Lithographic inks* are also prepared from lampblack mixed up with shellac, soap, wax, tallow, and gum solutions; while most of the so-called *indelible inks* consist of the same pigment suspended in a suitable medium. [INDIAN INK.]

Inkbag, the name of a gland in many of the Cephalopoda, such as the Pen-and-Ink Fish or Squid and the Octopus, which secretes a black sepia pigment. By means of this the animal discolours the water around it so that it is hidden from an opponent. The inkbag has been found with the sepia still in perfect condition in some of the fossil Jurassic Cephalopods.

Innes, COSMO (1798–1874), advocate, historian, and antiquary, born at the old manor-house of Durris, on Deeside, son of the Laird of Leuchars, was a sedulous contributor to the publications of the Bannatyne, Maitland, and Spalding Societies, editing many old cartularies. In 1840 he served as sheriff of Moray, and being in 1846 elected to the (then unpaid) chair of history at Edinburgh, proved a successful lecturer, and wrote a valuable work on early Scotch history.

Innes, LOUIS (1651–1738), was the principal (appointed 1682) of the Scotch College in Paris when James II. and his son were exiles in France. In 1714 he resigned his post, and became almoner to the ex-queen, and Secretary of State to the Chevalier de St. George. He is supposed to have compiled the memoirs of James II., of which an abstract by Dr. Clarke, who ascribed them to Louis' brother, THOMAS INNES (1662–1744), appeared in 1816.

Innocent III., POPE (1161–1216), Lothario. Count of Segni, member of the great house of Conti, born at Anagni. He gained great reputation during

his studies at Rome, Paris, and Bologna; and on the death of Celestine III., during whose reign he composed his great work, *De Contemptu Mundi, sive de Miseria Humanæ Conditionis*, was, at the early age of thirty-seven, proposed as Pope by Cardinal John of Salerno, who had refused the pontificate, and at once unanimously elected. Innocent speedily became the great champion of the temporal power and the ascendancy of the Papacy. His erudition and diplomatic skill, combined with a remarkable genius for gaining and maintaining power, enabled him to humiliate the imperial prefect of Rome, and to drive the imperial seneschal, Duke Markwald of Romagna, out of the Mark of Ancona, and to wrest the duchy of Spoleto from Duke Conrad, thus, and by skilful diplomacy, gaining possession of the "States of the Church." He secured the kingdom of Naples, as guardian of the young King Frederick (afterwards the Emperor Frederick II.), against the designs of Markwald. In 1198 he established the inquisitorial tribunals which were the germs of the Inquisition. In 1200 he excommunicated Philip Augustus, King of France, and laid his kingdom under an interdict; in 1209 he crowned his nominee, Otto IV. (of Brunswick), emperor at Rome, the murder of Philip of Swabia having delivered Otto and the Pope from a disastrous war; and in 1212 deposed King John of England, after having excommunicated him and laid England under an interdict. The Pope at this time dominated the greater part of Western Europe. In 1215 he held a great council, the fourth Lateran, of 1,300 prelates and ambassadors, by which the dogmas of transubstantiation and the obligation of auricular confession were promulgated, the Pope's *protégé*, Frederick, was acknowledged as Emperor of Germany on his promising to conduct a crusade (the fifth), the Franciscan and Dominican orders were confirmed, and severe decrees against heretics and Jews were issued. The crusade against the Albigenses which Innocent organised (1209) has tarnished the memory of this heroic pontiff, while his free use of the terrible instruments of excommunication and interdict suggests that his nature inclined towards cruelty. Of blameless life himself, he made strenuous efforts for the reform of morals in the Church.

Innocent XI., POPE (1611–89), Benedict Odescalchi, born at Como, after serving as a soldier became a priest, and on the death of Clement X. (1676) was elected Pope. He was distinguished for his efforts to reform the administration and the morals of the Papal court, and for his opposition to the Jesuits. Louis XIV. quarrelled with him for abolishing the sanctuary allowed in the privileged quarters round the residences of some ambassadors in Rome, with the result that Papal pretensions received a severe check in France, and that the Pope preferred the cause of William of Orange to that of Louis' *protégé*, James II.

Innominate. The artery of that name is a branch of the ascending aorta. The innominate bone is the name given to the pelvis.

Innsbruck, the capital of Tyrol, lat. 47° 16' 18" N.; long. 11° 23' 53" E., stands 1,754 feet above the

sea-level, on the River Inn. It contains fine churches, some of which are famous for works of art, the general school for all Tyrol, and the university, besides some remarkable bronze statues of the 16th century, and has extensive suburbs. The Hofkirche contains the tombs of Maximilian I. and Hofer. The Provincial Government or Diet for Tyrol has its seat here, as also the Assembly of Estates, established 1816.

Inns of Court (*Hospitia curiæ*). The Societies of the Middle Temple, Inner Temple, Lincoln's Inn, and Gray's Inn are so called because the students therein study the law to fit them for practising in the Law Courts. These, together with the Inns of Chancery and the two Serjeants' Inns, are said to have formed one of the most famous universities in the world for the study of laws, and here exercises were performed, lectures read, and degrees conferred in the Common Law, as they are at other universities in the present day in the Canon and Civil Laws. The degrees were those of barristers (first styled apprentices, from *apprendre*, to learn), who answered to our bachelors as the style and degree of a serjeant (now abolished) did to that of doctor. These studies are now under the control of the Council of Legal Education, who have endeavoured to reinvigorate them by holding out rewards for excellence in the various branches of legal study, and particularly in Roman law and jurisprudence, and by making a certain standard of excellence compulsory upon all students seeking admission as barristers. The Inns of Chancery, Clifford's Inn, Symond's Inn, Clement's Inn, and others are subordinate to the Inns of Court properly so termed.

Inoceramus, a genus of bivalved mollusca (or Lamellibranchiata), of which the shells are common in the English chalk.

Inoculation. It was at one time a common practice to inoculate small-pox, with a view to producing the disease in a mild form, and protect the system against a subsequent attack of a severer form of the malady. Such inoculation was introduced into England early in the last century by Lady Mary Wortley Montagu, who was made familiar with the practice in Constantinople, to which place it was introduced from the East. The discovery of vaccination led to the gradual extinction of inoculation, and in 1840 the latter proceeding was prohibited by law.

Inoperculata, a term applied to the Gastropoda (q.v.), of the order Pulmonata, in which the animal is not provided with an operculum or lid, for the closure of the shell. Thus, among our English snails all belong to this order except the one species of *Cyclostoma*.

Inosite, a compound of composition $C_6H_{12}O_6$, which occurs in leguminous plants and also in the muscles of the heart, the lungs, and other parts of the human body. It forms colourless rhombic crystals, soluble in water and possessing a sweet taste. Its chemical reactions indicate that the substance is related to benzene (q.v.), being hexahydroxy hexahydrobenzene $C_6H_6(OH)_6$.

Inquest (*Inquisitio*), an inquiry by a jury

duly empanelled by the sheriff or other lawful authority in any cause, civil or criminal. The term inquest is sometimes used to signify the jury itself, before whom the question is brought. [CORONER.]

Insanity. The term insanity as popularly understood is commonly held to include those forms of mental derangement which are accompanied by such loss of self-control as to constitute the patient a danger to himself or others, and to make it desirable that he should be subjected to some form of restraint. The term is not ordinarily held to include the delirium met with in fever, or as the result of alcohol, or hysterical conditions. The symptoms may be classified under three heads—*sensory*, *motor*, and *intellectual*. Under sensory symptoms hallucinations and illusions may be especially referred to. An illusion may be described as a perverted sense impression, while in hallucination sense impressions are created in the organs of sense apart from any actual exciting cause from without; the patient hears voices, sees objects, or detects odours, which have no existence outside his own consciousness. Among motor symptoms, conditions of spasm or paralysis may be present; in general paralysis of the insane, phenomena of the latter kind play an important part in the development of the disease. The symptoms of disturbance of intellect are very various; the despondency of melancholia and the restless excitement of mania, moral perversion, the existence of delusions, and suicidal or homicidal tendencies represent some of the most common kinds of mental alienation. The chief forms of insanity are as follows:—

Melancholia. In this condition mental depression is the characteristic symptom; it is often associated with defective powers of digestion and sleeplessness; sensation is commonly impaired; hallucinations are often present. Delusions (possibly associated with ideas of religion) may occur, and a tendency to suicide is common. Melancholia *attonita* or melancholia with stupor is a peculiar variety of this form of insanity. Melancholia may end in recovery, or become chronic and finally pass into a condition of dementia; it may precede or follow mania.

Mania. In mania there is excitement as opposed to the depression of melancholia. The patient is noisy and restless, his memory is usually very defective, and he often proceeds from one train of thought to another with that rapidity and aimlessness of transition which is characteristic of *incoherence*. There may be complete recovery from the condition, or the mania may become chronic, the patient chattering incessantly and his mental condition steadily degenerating. In some cases mania forms part of what is called *folie circulaire*, in which condition mania is succeeded by melancholia, which in its turn gives place to a further development of the maniacal condition, and so on.

Monomania. In monomania the characteristic symptom is the presence of fixed delusions, often relating to the exalted condition of the patient or to his being persecuted by imaginary foes.

Dementia is the condition of mindlessness to which all chronic forms of insanity gradually tend. It may be developed primarily and apart from the conditions of mania or melancholia. The characteristic symptom of dementia is the *loss* of mental and moral qualities rather than their perversion. There is marked loss of memory, the delusions developed in the primary attack of insanity often persist, and hallucinations are common. The weak-mindedness of idiocy and the manner in which it differs from dementia have been discussed under that head. [IDIOTCY.]

General paralysis of the insane is a form of insanity which stands quite apart from the other varieties; it is much more common in men than in women, and usually attacks subjects in the prime of life. Paralysis is a marked phenomenon, and is associated with tremor; speech is affected in a characteristic manner; the pupils are often unequal; and the patellar reflex may be lost. The mental symptoms often assume the form of what is known as grandiose delusion, the patient imagining himself to be possessed of certain qualities or attributes to a preposterously exaggerated degree. General paralysis is a disease which always proceeds from bad to worse; it usually runs its course in the space of about three years, and in its final stages the patient is reduced to a condition of complete helplessness.

Causes of Insanity. Among the predisposing causes of insanity the existence of an hereditary tendency to nervous instability is perhaps the most important. Nationality does not appear to play a very important part in the matter, and as regards sex there is no marked difference in the incidence of the disease on males and females. General paralysis, however, affects men far more frequently than women, while women are specially liable to develop insanity in connection with the period of child-bearing.

As regards exciting causes, intemperance, certain chronic forms of disease affecting the nervous system, and the association of attacks of insanity with pregnancy, labour, and lactation may be alluded to. Patients sometimes become insane during the period of convalescence from acute febrile diseases, and certain chronic affections such as phthisis have distinct relationships with insanity.

The treatment of insanity is directed mainly on the lines of securing quiet for the mind just as rest is enjoined in the case of an injured limb. Change of associations is often beneficial, and such restraint as may be necessary must be judiciously exercised. A great improvement has been brought about within recent years in the treatment of pauper lunatics; the victim of insanity is no longer regarded as a malefactor to be chastened into a return to normal conditions, but as a patient demanding systematic and scientific treatment.

A person for whom restraint is deemed necessary is placed under certificates—that is to say, he is certified to be insane by two medical men, and an order for his admission to an asylum is obtained. In cases where questions of the disposal of property are concerned, the much more elaborate procedure of an inquiry by a “Master in Lunacy” is resorted to.

The licensing and inspection of public and private

asylums, control in matters relating to certificates of insanity, regulations concerning the admission of patients, etc., are vested in a body known as the Commissioners in Lunacy.

Insect-fertilisation. [FLOWER.]

Insectivora, an order of mammals, containing numerous small, generally nocturnal forms, of which the Shrews, Moles, and Hedgehogs offer familiar examples. They are very widely distributed, and constitute two sub-orders: (1) *Insectivora Vera* (True Insectivores), with free limbs, adapted for running, climbing, burrowing, or swimming, and (2) *Dermoptera* (with claims to ordinal rank) having the limbs united by a membrane. [FLYING LEMURS.] The diet of most consists of insects, frogs, lizards, mice, etc., but one form (*Potamogale*) lives on fish and *Galeopithecus* on fruit.

Insectivorous Plants. [CARNIVOROUS PLANTS.]

Insects are the members of the best known class of all the Arthropoda (q.v.). They belong to the subdivision of this phylum known as the Tracheata, because they breathe by means of a series of internal air passages known as tracheæ, which ramify through the tissues. The body is divided into three regions—head, thorax, and abdomen, each of which consists of a series of rings more or less fused together. The thorax bears three pairs of legs and the wings, of which there are usually two pairs. The head carries a pair of antennæ or feelers, which are very varied in form. The main function is that of touch, but they may also act as organs of hearing or smell.

Nearly all insects pass through a metamorphosis or series of stages, which are very different in appearance: thus, after being hatched from the egg, they usually occur as the worm-like caterpillar, then as the fixed, quiescent stage of the chrysalis or pupa, from which emerges the imago or perfect insect. But any of the intermediate stages may be skipped: thus, the egg stage is missed in some beetles, in which the young are born as caterpillars; such are said to be “viviparous.” In some flies both the egg and caterpillar stages are wanting, and the young are born as pupæ; these are known as “pupiparous.” In some plant lice, etc., the young exactly resemble the adults, and there is no metamorphosis. In some few cases, on the other hand, there is an additional stage introduced as in *Mantispa*; these are said to show hypermetamorphosis.

The metamorphosis is *complete* when a resting or chrysalis stage intervenes between the caterpillar and adult, as happens in butterflies; these are known as “holometabolous.” Or the metamorphism may be *incomplete* when the pupa is active, so that the three stages are not sharply marked off; these are either ametabolous, in which the larvæ are like the adults, or hemimetabolous, when it undergoes considerable change.

Parthenogenesis (q.v.) and *dimorphism* are both well illustrated and common among insects.

The appendages are the most striking features of the insects. In most cases the adults have three



INSECTS.

- 1 THYSANURA: *Hepisma Saccharina* (Spring-tail). 2 THYSANURA: *Orchesella cincta*. 3 and 4 HEMIPTERA: Wingless aphides or plant lice, male and female. 5 HETEROPTERA: *Acanthia lectularia* (Common bed bug). 6 NEUROPTERA: *Myrmeleo formicarius* (Ant-lion). 7 ORTHOPTERA: *Forficula auricularia* (Common earwig). 8 DIPTERA: *Estrus (gasterophilus) equi* (Horse-fly, male). 9 COLEOPTERA: *Cetonia aurata* (Rose beetle). 10 STREPSIPTERA: *Stylops spencei*. 11 HYMENOPTERA: *Apis mellifica* (Female bee). 12 HYMENOPTERA: *Vespa vulgaris* (Common wasp). 13 LEPIDOPTERA: *Vanessa polychloros* (Large tortoise-shell butterfly). 14 LEPIDOPTERA: *Vanessa polychloros* (Chrysalis of same).

(The lines indicate the natural size of the insect; where no lines are given, the figures are themselves the natural size).

pairs of legs and two pairs of wings. Both of the latter may be used for flight, or they may be alike as in the Homoptera (q.v.), different as in the Hemiptera, etc.; or only one pair may be used for flying, the anterior pair serving to protect the more delicate posterior pair; or the posterior pair may be rudimentary as in flies. In some insects the wings are absent, and in one group (*apterygogenea*) (q.v.) no wings were present even in the ancestors. The legs in the adult are usually six in number, and each consists of five joints, known as the coxæ or hips, trochanters, femora (thighs), tibiæ (shanks), and tarsi (or feet). The number of legs may be reduced as in the Fritillaries. In the caterpillars there are also a series of claspers or prolegs, which vary in number from 10 to 22. In some cases there are rudiments of true legs on the abdomen, such as the cercopoda (q.v.) of the Orthoptera. The remaining appendages on the abdomen are not true legs; the principal one is the ovipositor, which in many cases also acts as the sting (*e.g.* in Wasps). Neither are the antennæ true limbs as they are in the crabs. The appendages of the mouth vary considerably in different orders, according to whether the insect feeds by sucking or biting.

The nervous system consists of a series of ganglia connected by a cord along the ventral side of the body; one ganglion (or a fused pair) occurs above the œsophagus, and is united to the main chain by a nerve on each side of the œsophagus. In the imago the nervous system is more concentrated, and the primitive arrangement can be seen best in the caterpillar. A sympathetic system is also present, and controls the opening of the breathing pores or stigmata.

The sense organs are well developed; there is usually a pair of compound eyes and often a few additional simple eyes or ocelli. In some, such as fleas, *Collembola* (q.v.), etc., only ocelli are present. Many of the parasitic species are blind. Many insects can detect the ultra-violet rays, which are invisible to the human eye. The sense of smell is often very keen, but they have but a dull appreciation of pain.

The circulatory system is fairly simple, and consists typically of a long vessel along the back.

The digestive system is usually complex, but is imperfect in many of those which have a very short life. Thus, in the larvæ of *Dytiscus* and *Ephemera* there is no mouth, and the animal gains its food by suction through its perforated jaws (or mandibles); in some the stomach ends blindly, as in the larvæ of many Hymenoptera; in others there is no digestive system at all, as in the *Phylloxera*.

The renal or excretory organs (nephridia) may be few as in butterflies, or numerous as in ants. This character is of great value in classification. Silk glands (sericteria) occur in many insects, notably the silkworms.

Respiration is very important, and is effected by tracheæ of very various forms. They usually consist of minute tubes ramifying through the body and opening to the exterior by a series of pores, known as spiracles or stigmata; as a rule there are none on the head, but some occur there in a few *Collembola* (q.v.) and some Lepidoptera larva. In

some insects (known as apneurtic) the tracheal system is closed, as in the Mayflies and the larvæ of *Dytiscus*, and the respiration is then effected by the walls of the rectum. In other cases there are outgrowths of the tracheæ known as "tracheal gills" (q.v.).

The insects are probably always bisexual, the only exceptions being due to malformation.

There are probably about 250,000 described species of insects, and the classification of this great multitude is necessarily complex. The most recent is that of Brauer, based on the embryology and the characters of the nephridia; but the older and simpler classification is here adopted in the main:—

Class I.—APTERYGOGENEA:—

Collembola (springtails).

Thysanura.

Class II.—PTERYGOGENEA:—

1. Orthoptera (locusts, etc.).

2. Neuroptera (dragon flies).

3. Strepsiptera.

4. Rhynchota Hemiptera (plant lice).
Heteroptera (bugs).

5. Diptera (flies).

6. Lepidoptera (butterflies and moths).

7. Coleoptera (beetles).

8. Hymenoptera (ants, wasps, etc.).

Insects are not common as fossils, except in amber, resins, and some plant beds. Most of the existing orders begin in the Lias or Trias, but the Apterygogenea are not known before the Oligocene. In the Palæozoic (q.v.) there are four extinct orders, the Orthopteroidea including the Silurian *Palæoblattina douvillei*, Br., the oldest known insect. The Neuropteroidea includes one Devonian species, the rest of it and the whole of the Hemipteroidea being very abundant in the Carboniferous. The richest fossil insect faunas in England occur in the Jurassic limestone.

Insertion, the relation of the floral leaves to the receptacular portion of the flower (q.v.). The calyx (q.v.) is termed *inferior* if not adherent to the ovary; *superior* if adherent, whilst the ovary is known conversely as *superior* in the former case and as *inferior* in the latter. The corolla (q.v.) is either *hypogynous* (q.v.), *perigynous* (q.v.), or *epigynous* (q.v.), according as the receptacle retains the primitive tapering form of an ordinary shoot, or is expanded above into a disc or cup round (but free from) the ovary, or is adherent to it. The stamens (q.v.) are generally described as having the same insertion as the corolla; but in gamopetalous or gamophyllous flowers a zone of intercalary growth has sometimes carried both petals or perianth-leaves and stamens up on a tube, which, though truly common to both, is termed a corolla-tube or perianth-tube. The stamens are then termed *epipetalous*, as in the hypogynous primrose and in the epigynous Compositæ, or *epiphyllous*, as in the hypogynous hyacinth and in the epigynous iris. Insertion is a character of very great importance in classification.

Insessores, a lapsed order of birds. [CORACOMORPHÆ.]

Instantaneous Centre, in any moving mechanism, means the point at any given instant that is for the moment motionless. A wheel rolling

along the ground has one point in contact with the ground. This point is for the moment held motionless, and thus acts as the instantaneous centre, the rest of the wheel swinging round it.

Insulation. In *electricity* it is usual to classify substances according to their ability to conduct electricity, or, in other words, according to their power to resist the stress caused by the separation of opposite electrifications. There is no line of separation between conductors and insulators, but if good insulation is demanded substances such as air, glass, paraffin, ebonite, shellac, or porcelain are selected. Thus the insulation material for an ordinary Leyden jar is glass; to prevent leakage from a telegraph-wire to the ground through the telegraph-posts, insulators of porcelain are used. The covering of submarine cables is of gutta-percha or some such compound, strengthened by an outer casing of wire rope. The insulation for ordinary alternating currents is generally of the above nature also; but for high potential and high frequency alternations it seems that ordinary insulators are liable to break down, small flaws rapidly increasing in size, even though at first they may not be detected. To avoid this, oil insulation has been proposed; being fluid, its tendency is to correct any flaws that may momentarily appear.

Insulators. [INSULATION.]

Integripalliata, a group of bivalved mollusca belonging to the class Lamellibranchiata. It includes those forms in which the line of the attachment of the mantle or pallium is not indented by a notch, due to the impression of the muscles, which retract the long respiratory siphon. [ANODON.]

Intensification. In the production of a photographic negative [PHOTOGRAPHY] or transparency it frequently happens that the developed image, though exhibiting all the detail of the picture, has not sufficient *density*, or is not opaque enough, to be useful for its required purpose. It may then be rendered denser or more opaque by some of the numerous methods of *intensification* in vogue among photographers. The simplest, and that most commonly adopted, is probably an intensification by means of mercuric chloride (corrosive sublimate HgCl_2). The negative is placed in a solution of this salt until the whole image becomes completely whitened owing to the union of the mercuric chloride with the silver of the image. It is then well washed by water to get rid of the excess of the mercury salt, and placed in a dilute solution of ammonia, by the action of which the whitened salt is again blackened, giving a far denser and more opaque image than the original. Other modes of treating the whitened image may also be adopted, or intensification may be effected by other *intensifiers*, as lead or uranium salts; but for details of various processes reference should be made to books on photography.

Interest, payment for the use of money; it may be either *simple* or *compound*. Simple interest is that arising from the principal only; compound, that paid on the principal and the interest as it falls due, and if unpaid, it is added to the principal.

Interference, in physics, signifies the neutralisation of waves by their coalition when not in the same phase (q.v.). If one wave combines with another of the same amplitude and wave-length, but just half a wave-length ahead of the first, the crest of the one is neutralised by the trough of the other, and *vice versa*. The result is that no displacement is witnessed at their combination. This may be most readily apprehended in the case of waves of water, though the generalisations on interference are applicable also to sound-waves in air or to light or electric waves in ether. If the two waves combine when in the same phase, the resultant is a wave of double amplitude. This effect is visible at the Niagara River Rapids, where waves reflected from the sides of the gorge unite at the middle of the stream and cause that portion to be considerably higher than the sides. Interference in sound-waves may be exhibited by sounding together two consecutive notes on a harmonium, differing only by a semitone. Here the waves are of slightly different length, and at regular intervals one is nearly quenched by the other, the phenomenon of *beats* being produced. Beats may be more readily noticed in clanging bells, which are apt to give out notes very near each other in wave-length and frequency. Closely analogous to beats in acoustics is the phenomenon of twinkling stars in optics. From the same distant source of light two waves may be regarded as passing to the eye of the observer. If they had passed through identically the same medium, they would arrive in the same phase and so combine; but occasionally one wave is slightly retarded, and arrives in a condition to neutralise the other. Assuming white light to come from the star, it may thus happen that the red rays are for a moment extinguished and the remaining rays give the colour to the star. Thus in the case of a star like Sirius, light interference causes it to change colour continually; smaller stars having much less brilliancy appear to go out entirely. Diffraction (q.v.) is due entirely to interference, which is also the fundamental reason for the colours presented when crystals are seen by polarised light, when a soap-bubble is viewed in sunlight, or when a piece of plane glass is pressed upon a slightly convex glass surface.

Interlaken, or INTERLACHEN, a beautifully situated village in the canton of Berne, Switzerland, in the Boedeli valley, near the Aar on the left bank, "between the lakes" of Thun and Brienz. It is a very popular resort for tourists and visitors, especially English and American. One of its attractions is a fine old castle.

Intermittent Fever. [AGUE.]

Internode, that part of a stem that intervenes between two *nodes* or points at which successive leaves are given off. Internodes are fairly well seen in the fresh-water alga *Batrachospermum*. In Characeæ, as in not a few higher plants, there is a marked difference in the internal structure of nodes and internodes. In most grasses the nodes are solid, but the internodes hollow. In most flowers, in buds, on the dwarf-shoots of larch and cedar, or

in plants with rosettes of leaves, the internodes are very slightly elongated; but in some bamboos each internode reaches a length of several feet.

Interpolation, in mathematics, is a useful process of obtaining approximately a number corresponding to a given quantity when the two numbers corresponding to two other such quantities are known. Thus, if the average height of a person 15 years old be known, and also that of a person 16 years old, it is a simple matter to calculate approximately the average height for an age of $15\frac{1}{2}$ years. The one assumption in this case is that the growth during the year is uniform. On this one assumption much interpolation is effected in mathematics, such as the calculation of the cosine (q.v.) of an angle of $23^{\circ} 16' 5''$ when the cosines of $23^{\circ} 16'$ and of $23^{\circ} 17'$ are known; or the calculation of the logarithm (q.v.) of the number 62174 when that of 62170 and 62180 are known. By graphical methods the process may be extended considerably, even when the variation of the one quantity is not proportionate.

Intestacy occurs when a person dies without making a will. As to his real estate, *see* DESCENT. As to his personal estate, the disposition of it is regulated by the "Statute of Distributions," the principal one being the 22 and 23 Charles II., c. 10.

Intestine. [DIGESTION.]

Intussusception. By this term is meant the folding of one portion of bowel into an adjoining portion; its occurrence is usually productive of intestinal obstruction, and (the blood supply to the infolded portion of bowel being cut off) gangrene and sloughing may occur. The disease sometimes affects young children, but is otherwise very rare. Operative treatment is sometimes needed; the condition is in all cases of serious import.

Inulin, a substance of the group known as *Carbohydrates* (q.v.), which in many respects closely resembles starch. It occurs in the roots of the dahlia and other plants, and forms a white powder insoluble in cold, forming a mucilage with hot water. By boiling with dilute acids it is completely converted into fruit-sugar or levulose. It is distinguished from starch by giving a brown instead of a blue coloration with an iodine solution.

Inventory, a schedule or detailed statement containing a true description of goods and chattels or furniture, etc., made upon a sale or by an executor or administrator of a deceased person.

Inverness, capital of the Highlands of Scotland and of the county of Inverness-shire. is situated on the south coast of the Moray Firth near the mouth of the river Ness, which divides the town into two parts, the southern being the most populous and important. Vessels of 200 tons burden can lie alongside the quay of the harbour. The handsome modern town has grown up within the last hundred years.

Investiture, the delivery of corporeal possession. It is now more particularly applicable to the

temporal part of a benefice, as the term "institution" is to the spiritual. And when a clerk is presented, instituted, and inducted into a living, he is then, and not before, invested with full and complete possession. In mediæval times it was a constant subject of dispute between temporal and spiritual authorities. In Feudal Law it was the delivery of possession of land granted by a lord to his tenant, and corresponded to the more modern term livery of seisin. Investiture is also one of the formalities by which the election of a bishop is confirmed by the archbishop of the province. The term also applies to a grant of honour or dignity, *e.g.* the investiture of anyone with the Order of the Garter.

Invocation, the act of calling up a spirit, or the formula employed. [FAUST.]

Involucre, a whorl of bracts (q.v.) below an inflorescence. In the globe artichoke (*Cynara Scolymus*) it is the succulent bases of the bracts of the involucre that are eaten. Smaller secondary involucres terminating secondary peduncles, as in the compound umbels of many Umbelliferae, are known as *involucels*.

Involute, "rolled inwards," a term applied to leaves having their margins rolled in over their upper surfaces, as in the sticky insect-catching leaves of the butterwort, or in those of the violet, or in the case of many petals. In geometry it is a curve derived from another, termed its evolute (q.v.), by what may be called a process of unwinding. Taking the simplest case, that of a circle as evolute, if we regard a thread as being wound round a circle, the curve traced out by its free extremity when unwound is the involute of the circle. In any other curve there is a corresponding involute, which is definable as that curve which possesses the property that the length of the tangent drawn from any point on it to the original evolute is equal to the length of the evolute between the tangent point and the point of commencement of the involute. The involute of a cycloid is an equal *cycloid*; that of a circle is the ordinary *spiral*; that of the catenary is a *tractrix*.

Involution, in mathematics, signifies the raising of a number to any required power. To cube a number, for example, is a process of involution. The opposite process, that of obtaining any root of a number, is called *evolution*.

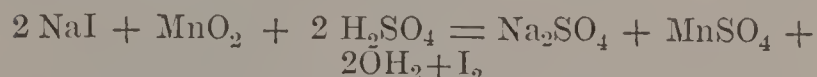
Iodates. [IODIC ACID.]

Iodic Acid has the composition of HIO_3 , and forms transparent six-sided crystals soluble in water. It may be prepared by the action of nitric acid upon iodine, and by other chemical reactions. It forms well-defined salts, called *iodates*, of which the greater number are insoluble. Sodium iodate frequently occurs associated with *Chili saltpetre* (q.v.), and on this account the acid is sometimes found as an impurity in nitric acid prepared from this source. Neither the acid nor its salt are of any great practical importance.

Iodides are the salts of *Hydriodic Acid* (q.v.), *i.e.* are hydriodic acid in which the hydrogen has been replaced by a metal, or equivalent group of

elements. Of these the most important is potassium iodide, which is very largely employed for chemical and other purposes, while many iodides are used to a great extent in medicine and photography. Other compounds of iodine with elements other than metals are also termed iodides, as, *e.g.*, iodide of phosphorus, etc.

Iodine is a non-metallic elementary substance possessing the atomic weight 127 and represented by the symbol I. It was discovered at the beginning of the present century by the chemist Courtois in the seaweed *kelp*, and this substance has ever since formed an important, and was for a long time the only, source of the element. It occurs to a small extent in many minerals, plants, and a number of spring waters, usually combined with potassium, calcium, or magnesium. From the *kelp* it is prepared by thoroughly macerating the burnt seaweed with water and allowing the solution obtained to crystallise. Many salts separate out, but the iodides being very soluble remain in solution. The liquid thus obtained is placed in large iron stills, and sulphuric acid and manganese dioxide are added. The stills are heated, and iodine passes over and condenses in a series of condensers attached to the stills. The reaction is represented by the equation:



It is afterwards purified by resubliming.

As thus obtained iodine is a dark grey opaque shining solid, which crystallises in rhombic prisms. It gives off vapours at ordinary temperatures, and readily if heated; the vapour is of a very fine purple colour, and possesses a very high density, being $8\frac{1}{2}$ times heavier than air. It possesses an odour resembling somewhat, but not so disagreeable as that of, chlorine or bromine, which are closely allied elements. [HALOGENS.] The solid melts at 113° , and possesses a specific gravity of 4.9. It is slightly soluble in water, and readily in alcohol, chloroform, carbon disulphide, or a solution of potassium iodide. Even in very minute quantities it gives a remarkably fine blue coloration with starch solution, by which means it can be readily detected. Both free and in its various compounds iodine is of very extensive use for scientific and industrial purposes. In the chemical laboratory it finds innumerable applications for many purposes; large quantities are employed in the manufacture of the various aniline dyes; in photography it is very extensively used, chiefly as the silver salt; but by far the greatest quantity is required for medicinal purposes. In medicine it is used in preparation of tinctures, liniments, etc., for external application, and for medicinal draughts, either in inorganic combination, as iodides of potassium, sodium, lead, arsenic, mercury, etc., or in organic compounds as ethyl iodide, iodal, iodoform, etc. [See also HALOGENS.]

Iodoform, a compound of composition CHI_3 ; *i.e.* similar to chloroform (q.v.) with the substitution of iodine for the chlorine; which is obtained by the action of potash upon alcohol or acetone. It forms yellow crystals of the hexagonal system,

is soluble in water, and possesses a saffron-like odour. If warmed with carbolic acid and potash, a red coloration is obtained, and this forms a convenient method of testing for the compound. It is much used in surgery for its antiseptic properties. There are two preparations in the pharmacopœia—the suppository and the ointment. Iodoform wool and iodoform gauze are employed in the treatment of wounds, and iodoform powder is often dusted over ulcerated surfaces. When used in excessive quantities the substance has been absorbed freely, and has been known to produce severe constitutional symptoms.

Ion, in electrolysis, is the name given to the product deposited at either terminal of the electrolytic cell. With the ordinary conventions for the direction of flow of a current of electricity (q.v.) the product deposited at the terminal where the current enters is called the *anion*, and that at the terminal where the current leaves is called the *kathion*.

Iona, or ICOLMKILL, the first seat of Christianity in Britain, is a small island of the Hebrides group. It was originally a seat of the Druids, who were in 565 converted or expelled by St. Colomb. It is three miles long and one broad, and belongs to the parish of Ross in Mull.

Ionian, the name of the central portion of the west coast of Asia Minor, bounded by the Hermus on the north and the Mæander on the south, which was colonised by Ionian Greeks, said to have migrated under Androcles and Neleus about B.C. 1050. The chief cities of the Ionian confederacy were Miletus, Chios, Samos, and Ephesus, and later, Smyrna, its limits extending to the islands and the adjacent districts. The chief sanctuary of the league was the Panionium on the north side of the promontory of Mycale. The cities of Ionia were subdued by the Lydians under Cræsus, and fell with Lydia under the Persian yoke. Their unsuccessful revolt (B.C. 500–496) led to the invasions of Greece by Darius and Xerxes. After the repulse of the latter they regained independence for a time (B.C. 469–387). After the conquest of Alexander the Great, Ionia formed part of the Macedonian kingdom of Pergamos, and in B.C. 130 became part of the Roman provinces of Asia. The territory has never recovered from its devastations by the Saracens. Ionia was famous for arts, literature, and luxury.

Ionian Islands, a group of islands in the Ionian Sea, off the western coasts of Greece and Albania; formerly a republic under the protection of Great Britain, since 1864 part of the kingdom of Greece. The chief islands are Corfu, Santa Maura, Ithaca, Cephalonia, Zante, and Cerigo, and about eight others. The inhabitants are mostly of Greek origin. The productions include corn, vines, olives, currants, cotton, honey, and wax.

Iowa, one of the United States, bounded N. by Minnesota, E. by Mississippi, S. by Missouri, W. by Dakota and Nebraska. It was first colonised in 1832; the territorial government was instituted

1838; it was admitted into the union 1846. Length, 285 miles; breadth, 190 miles; area, 56,025 square miles, three-fourths of which is luxuriant prairie. The capital is Des Moines; it was formerly Iowa, the capital of Johnson County.

Iowas (IOWAYS), a North American people, who were a branch of the Southern Dakotas, and whose domain formerly comprised several western affluents of the Middle Mississippi; especially the Iowa, named from them. None are now found on the banks of this river, or in the State of Iowa, also named from them; but a few still survive in the Great Nemaha Reservation, Kansas, and in the Sac and Fox Reservation, Oklahoma—these two groups, with a few individuals elsewhere, jointly numbering 273 in 1890. The Iowas were the constant allies of the Algonquian Sacs and Foxes, whose hunting-grounds extended along the opposite (left) bank of the Mississippi.

Ipecacuanha, the root of *Cephaelis ipecacuanha*, a cinchonaceous creeping herb, native to Brazil, which is a most valuable emetic. The root is flexuous, little branched, and distinctly annulated; the leaves are oblong-obovate; and the small pentamerous flowers are collected in heads surrounded by a leafy involucre, and are dimorphic. The plant grows in moist shady forests between 8° and 22° south latitude. Though previously in use in Brazil, it was only introduced into Europe in 1672. As imported the root is a greyish or reddish brown, has a musty odour, and a bitter taste. It comes from Rio, Buenos Ayres, or elsewhere, in "serons," or cow-hide bales, weighing from 100 to 180 lbs., and our annual imports are about 65,000 lbs., valued at nearly £15,000. The plant has been introduced into India, through the Edinburgh Botanic Garden, since 1866, but not with much success. Other plants with emetic properties in a lesser degree are also known as ipecacuanha, but none of them are similarly annulated. The drug is largely used in medicine in the form of the acetic acid extract and of ipecacuanha wine; it is also made up in lozenges, and a lozenge containing morphia and ipecacuanha is sometimes prescribed. The well-known "Dover's powder" contains ipecacuanha, opium, and sulphate of potassium; this preparation is frequently employed with a view to promoting secretion from the skin. The pill of ipecacuanha and squills (which also contains opium) is often used in lung affections. Ipecacuanha is, however, best known for its emetic action, the wine being not infrequently used in cases where it is considered desirable to produce vomiting in children.

Iphigenia, or IPHIANASSA, daughter of Agamemnon and Clytemnestra, who was sacrificed to procure favourable winds for the Greek fleet assembled at Aulis for the expedition against Troy, where they were detained owing to Artemis' wrath against Agamemnon. In one version of the legend Artemis saved her to be her priestess at Tauris, whence she was rescued by her brother Orestes.

Ipswich, a seaport on the Orwell, 12 miles from Harwich, market town and capital of East Suffolk,

a municipal, parliamentary, and county borough. The chief industries are agricultural implements, with other engineering works and manufactures. Many remains of old timber in the houses show the antiquity of the town, which contains several interesting churches and handsome public buildings, including a museum, art gallery, mechanics' institute, public library, and the East Suffolk Hospital (founded 1835). Queen Elizabeth's school was endowed 1482; but its property was alienated with that of the priory of St. Peter and St. Paul, by Cardinal Wolsey, in 1528, to form the College of St. Mary. Soon the endowment was seized by King Henry VIII. (1535). Elizabeth in 1565 renewed and confirmed the charter. The principal exports are agricultural implements, railway plant, artificial manures, oils, oil-cake, bricks, and agricultural produce.

Iquique, a seaport in Peru, in the province of Moquegua, 3½ miles west by south of Tarapaca. Its chief exports are nitrate and borax, and the imports barley, flour, liquors, coal, machinery, iron, and steel. It was destroyed by earthquakes in 1868 and 1877, and in 1879 blockaded, bombarded, and captured by Chili.

Irak-ajemi, a province in Persia containing the cities of Teheran and Kashan.

Irak-arabi, the ancient Babylonia and Chaldea, watered by the Tigris and Euphrates.

Iranians, the indigenous inhabitants of the tableland to which they give their name, and generally of the whole region extending from the headwaters of the Euphrates and Tigris east to the north-west frontier of India. Their domain also comprised most of the Hindu-Kush, the western and northern slopes of the Pamir, and other tracts in eastern Turkestan since occupied by peoples of Mongolic stock. Irania thus includes the present Armenia, Kurdistan, Persia, Afghanistan, Baluchistan, Badakhshan, with parts of Bokhara and Fergana, all of whose primitive inhabitants form collectively a distinct and well-marked branch of the Aryan race, and most of whom were for long ages comprised within the limits of the old Persian empire. *Iran*, still the official name of Persia, is a term of extreme antiquity, being a modified form of *Aīryana*, which originally designated the land of all the Aryas—that is, of the settled agricultural populations of Aryan speech as opposed to Turan, land of the northern nomads of Turki speech. In recent times these nomads have encroached at many points, and especially in Persia, on the Iranian domain, which has also been invaded by other nomads, the Semite Arabs, from the south-west. Many of the Iranians themselves (Kurds, Baluches, Afghans) have either reverted to the nomad state, or always been nomads, owing to the arid nature of the lands they were compelled to occupy. Thus from the remotest times the Iranians are found divided into various groups, some constituted in powerful civilised states with a knowledge of the arts and letters, others scattered, as they are to this day, in small and rude pastoral communities over

the surrounding steppes. Such were in the north the *Baktrians*, representing the oldest Iranian culture, and the first to be organised in a great political body; the *Arakhtes* and many other hill tribes in the east, ancestors or precursors of the present Afghans; the *Gedrosians* in the south, rudest of all, from whom most of the modern Baluches are descended; the *Persians* in the south-west, who became under Cyrus the dominant people of Irania; lastly, in the west and north-west the *Medes*, who are now perhaps represented by the Armenians, but whose affinities have not yet been clearly determined. The Baktrian culture was spontaneous, and purely Aryan, whereas that of the Medes and Persians was developed under Semitic (Assyrian) influences, so that the *Pehlvi* (*Huzvaresh*) language current in the west under the Akhemenides, Arsacides, and Sassanides, became profoundly modified by Semitic elements. It was superseded by the *Farsi*—that is, the pure Iranian tongue of Fars, or Persia proper—from which is descended the neo-Persian, the literary language of most Iranians. But this also has become saturated, at least in its vocabulary, by a vast number of Semitic terms introduced by the Moslem Arab conquerors of the old Persian monarchy. At present the political autonomy of the Iranian peoples is confined to the new Persian monarchy, reduced to narrow limits, and ruled by a “Turanian” (Turkoman) “king of kings.” The Afghan Amir and the Khan of Baluchistan are virtually dependent on the British rāj, while the whole of Irania lies under the shadow of the northern Colossus. (Dr. F. Spiegel, *Erān, das Land Zwischen dem Indus und Tigris*, 1863.)

Iranic Languages form one of the main divisions of the Aryan linguistic family [ARYAN LANGUAGES], somewhat intermediate between the Indic and Hellenic, but considerably more akin to the former than to the latter branch. There are three distinct groups, the first comprising the *Old Baktrian*, commonly called *Zend*, in which are composed the *Avesta* and *Little Avesta* (Vendidād, Vispered, and Yasna), that is, the sacred writing of the Zoroastrian religion, and which is now best represented by the *Pushtu* (*Pukhtu*) of Afghanistan, and the *Galeha* tongues of the Iagnob valley and Kafiristan; the second comprising the *Old Persian* of the trilingual cuneiform inscriptions (1st column), which later degenerated into the mixed Irano-Semitic *Pehlvi* (*Huzvaresh*), and ultimately died out after the overthrow of the Sassanid dynasty by the Moslem Arabs in the 7th century. It is now best represented by the *modern Persian* literary language, which took its rise in Fars (Persia proper) about the year 1000 A.D., and to which the vernaculars of Kurdistan, Baluchistan, and Luristan (Bakhtiari Highlands) are cognate. The third group comprises the *Medic*, that is, the language of the middle column, which was probably the ancestor of the *Old* and *later Armenian*, and of the *Ossetian*, still current in the Darel district, Central Caucasus. Armenian preserves many of the old Aryan grammatical forms, which have mostly disappeared both in the modern Persian and Afghan, both now highly analytical and also mixed with numerous Arabic

terms and expressions. (Burnouf, Lassen, Rawlinson, Joseph Müller, Spiegel, Mohl.)

Irawadi, IRRAWADDY, or ERAWADI, a large river of Asia, which rises in South China, takes a southerly course through Thibet and Burmah, and discharges its waters by fourteen mouths into the Bay of Bengal; the most easterly channel passes by Rangoon. The large delta is chiefly jungle.

Ireland lies between lat. 51° 26' and 55° 23' N., and long. 5° 20' and 10° 23' W. It is bounded on north, west, and south by the Atlantic, and on the east by the Irish Sea or St. George's Channel. Its length, measured from Fair Head (Co. Antrim) to Crow Head (Co. Kerry), is 306 miles; its breadth from the extreme points of Mayo and Down, 225 miles. The total area is 32,524 square miles. The population according to the latest census, that of 1891, was 4,704,750, of whom 3,541,307 are Catholics.

Geography. Ireland is divided into four provinces, Ulster, Leinster, Munster, and Connaught, divisions, however, which now have hardly any practical significance, and are used mainly for geographical or topical reference. The origin of the names Ulster and Leinster is unknown, though various fanciful explanations have been offered. Connaught and Munster seem to derive theirs from famous kings who flourished in the second century—viz., Conn of the Hundred Battles, a northern, and Mumhan, a southern king. Connaught is in Gaelic *Conn-acht*, i.e. the children of Conn. Leth Mumhan, or Mumhan's Half, was originally the name of the whole of the south of Ireland. The suffix *ster* joined to the names of these by the four provinces is of Norse origin, and commemorates the age of Viking predominance in Ireland. The capital of Ireland is Dublin (Dub-linn = Black Pool), at the mouth of the Liffey. The counties of Ireland, thirty-two in number, are as follows:—*Ulster*—Antrim, Armagh, Cavan, Donegal, Down, Fermanagh, Londonderry, Monaghan, and Tyrone. *Leinster*—Carlow, Dublin, Kildare, Kilkenny, King's County, Longford, Louth, Meath, Queen's County, Westmeath, Wexford, and Wicklow. *Munster*—Clare, Cork, Kerry, Limerick, Tipperary, and Waterford. *Connaught*—Galway, Leitrim, Mayo, Roscommon, and Sligo. Before the Norman conquest there was a fifth province, Meath, which embraced the modern counties of Meath, Westmeath, Dublin, Louth, Longford, and portions of the adjoining counties—in fact, the whole mid-region of Ireland. From this territorial division a large tract around Dublin was withdrawn some time before the Norman conquest and formed into a Danish kingdom governed by Norse kings. Meath was erected into a palatinate by Henry II., and for centuries after the conquest was regarded as a special territorial division of the country; but in more modern times Meath has, as it were, lapsed into and been lost in Leinster.

Physical Aspect. Ireland, as to its eastern shore, is comparatively unbroken, and the shore-lands are low; but in the west, where it faces the Atlantic, the coast is broken and indented at a hundred points, and presents everywhere to the ocean a succession of high and rugged cliffs. The whole interior of the island is a champaign, rising here and there into

mountain ranges; but along the sea-coast it is girt with a rampart of mountainous country or zone of hills whose width averages about twenty miles. The mountains of Ireland are almost always soft and rounded in outline, and clothed with vegetation to the summits. Hence their character is oftener pleasing and picturesque than sublime and striking.



MAP OF IRELAND.

They are usually boggy, and on some the bogs run quite up to the summits. So Irish rivers never run very low even in the hottest summers, for the bogs hold the water like a sponge, and give it away slowly. The principal ranges are the Wicklow Mountains, the Galtees in Tipperary, the Slievenaman range between Tipperary and Waterford, the Mourne Mountains in Down, and the M'Gillicuddy's Reeks in Kerry. A very conspicuous mountain to those who cross the Channel is Slieve Donard, chief of the Mourne range, and the greatest mountain on the east side of Ireland. A remarkable geological feature is the great limestone plain which occupies almost the whole of the central district extending from Dublin to Galway and from the confines of Ulster to the borders of Cork and Waterford. This plain has a soil of great fertility. The most fertile portion of it, celebrated as the Golden Vale, runs from Limerick in a south-easterly direction through Tipperary. The soil of Ireland, which is excellent for grazing and root crops, does not lend itself remarkably to the production of cereals. Owing to the fine quality of the soil and the humidity of the climate the vegetation is rich, and its colour at certain seasons of the year brilliantly vivid. Hence

"the Emerald Isle," one of Ireland's many names. In ancient times the country was known as the "Isle of Woods," on account of the number and extent of its virgin forests, which at one time seem to have almost covered the island, so that various ancient kings, whose claims to remembrance seem to rest on their activity as wood-cutters, are honourably mentioned in the chronicles. These woods, much reduced in numbers and extent, were quite destroyed in the 17th century by Cromwellian settlers, who cut them down for smelting purposes and for export. In spite of the efforts of public-spirited landowners in more recent times to plant their estates, the island is by no means well-clothed in this respect. Those ancient forests supplied shelter to red-deer, wild oxen, and wolves. As late as the time of Cromwell the wolf was a public nuisance, so much so that the State supported packs of hounds for its suppression. In rivers and streams Ireland is particularly rich. The principal river is the Shannon, which flows between Leinster and Connaught, and which in its course forms such noble expansions as Lough Ree and Lough Derg, the Boyne, a beautiful stream flowing along the southern border of Ulster, the Liffey, the Moy, the Lee, the two Blackwaters, and the Suir, the Nore, and the Barrow, which unite their currents before meeting the sea at Waterford. All the Irish rivers have been celebrated by Edmund Spenser in the *Faerie Queene*, and described by him at length and with considerable local knowledge. The lakes of Ireland, besides those already mentioned, are Lough Neagh in Ulster, a splendid sheet of water, Lough Erne, the picturesque lakes of Westmeath and of Killarney, and Lough Mask, Lough Con, and Lough Corrib in Connaught. In former times the lakes of Ireland were far more numerous and of greater extent. Crannogs, or the remains of lacustrine habitations, are now often turned up in quite dry ground.

Inhabitants. The people of Ireland are composed of various racial elements. In prehistoric times the country was inhabited by a race supposed to be akin to the modern Basques, small, dark-haired, with oval-shaped heads. These people, at some date beyond the reach of history, were conquered by the Celts, large, fair-haired, blue-eyed, round-headed; according to tradition, the Celts reached Ireland from Spain. In the commingling of these races the language of the aborigines was lost. In the result we have a people generally but improperly regarded as the Celtic-Irish. The population became still more composite during the 9th, 10th, and 11th centuries, by the introduction of a very considerable Norse element. Again, in the 12th and 13th centuries, as the result of the Norman conquest, great numbers of Normans, English, and Flemings settled in the country. The frequency of such names in Ireland as Fitzgerald, Burke, Butler, Lacy, etc., shows the extent to which the Norman element has entered into the population of the country. The last important addition to the racial stocks was supplied by the English and Scotch colonists who settled in Ireland in the 17th century. To superficial observation the modern Irish nation consists of this English and Scotch element, on the one hand,

and a numerically greater Celtic element on the other, the former Protestant, and the latter Catholic. But, in fact, this so-called Celtic element is itself, as has been shown, highly composite; nevertheless, certain pronounced Celtic traits, showing the strength of the original stock, pervade the whole population. Generally speaking, we may say that the Irish are quick of thought and fluent of speech, and attach more importance to the assertion of individuality than to the authority of settled laws and rules. Their instincts are warlike. They are readily converted into soldiers, and, under a system which is at the same time just, firm, and considerate, adapt themselves more easily to discipline than might be expected. The Royal Irish Constabulary, numbering about 15,000 men, are singularly well-disciplined and well-conducted. The Irish character not being stiff and hard, but plastic rather, is readily affected by influences whether for good or bad. The mass of the population is Catholic in the ratio of nearly four to one, and up to the present time has been more under the influence of priests than any other European people. Recent events, however, seem to prove that the secular spirit is stronger than has been suspected, and that in future sacerdotal authority will be greatly reduced. The agrarian legislation of modern times, which has substituted for the peasantry fixed instead of capricious rents, and rendered them independent of their landlords, will probably produce a more self-reliant and self-respecting type of character than that which has hitherto been associated with the Irish peasant. Within the last quarter of a century the standard of comfort has risen greatly. Those who cannot secure adequate means of livelihood at home emigrate. They refuse to accept the poor and meagre conditions which satisfied their fathers. The peasantry must in future constitute the dominant political power of the island. Though Belfast and some other northern towns flourish through their linen manufactures, the industries of the country are mainly agricultural and pastoral. The future of Ireland, therefore, depends upon the peasantry. From the character of recent agrarian legislation it is probable that this class will ere long become proprietors of the soil, and probably exhibit a radical alteration of character.

History. It is now known that the history of Ireland, like that of the Norsemen, the Greeks, and other nations, commences with, or rather is prefaced by, an account of the ethnic deities worshipped by the people. The "idle fables," the strange and grotesque accounts of dim prehistoric races, Ceasairians, Nemedians, Tuatha De Danan, etc., are found to have a great significance. The religion of the Pagan Irish, so far as it can be recovered, is to be sought in those idle fables. Irish history is hardly studied at all in Ireland, but this branch of it is being studied very profoundly on the Continent. The impetus in this direction has been given by the study of Celtic traces in France and elsewhere on the Continent, and by the paucity of the results obtained in spite of all searching. Continental savants, having learned that Ireland possesses a very ancient Celtic literature, have betaken themselves

to its study with great avidity. The earliest authentic history does not show the Irish people in a tribal condition. They seem to have emerged from that state at a time prior to the advent of St. Patrick, whose evangelising mission to Ireland commenced in 432. He had previously spent his boyhood in the country, having been captured and enslaved by a band of Irish pirates. In this and the preceding centuries the Irish, under the name of the Scoti, had been overrunning Britain and carrying their predatory incursions into the heart of Gaul. The most famous commander of the Scoti at this period was Nial, surnamed "of the Nine Hostages." According to one account, it was Nial himself who actually took captive the boy Patrick. The apparent ease with which St. Patrick evangelised Ireland proves that for a long time prior to his arrival Christian influences from Britain and the Continent had been stealing into the country. St. Patrick was a man of a great and commanding personality, well equipped by nature to cope with Druids and hostile Pagans in all such assemblies as he frequented. Some of his writings survive. The finest of them by far is a hymn called the *Lorica Patricii*, or the Breastplate of Patrick, a very noble and even sublime effort in religious poetry. It has been incorporated in the hymnology of the modern Protestant Church of Ireland, and is sung annually in St. Patrick's Cathedral in Dublin. After the death of St. Patrick the Irish Church assumed an exclusively monastic form. The monasteries which were now founded in a short time became renowned over all northern Europe for sanctity and learning. Chief among these were the monasteries of Bangor, Clonard, Clonmacnoise, Durrow, and Iona. The latter, though erected on an island off the Scotch coast, was the work of an Irish saint, the celebrated Columba, who, in ecclesiastical fame, ranks next to St. Patrick. Ciaran, founder of Clonmacnoise, is the third most famous. Such was the repute of these Irish monasteries that in the 6th and the succeeding centuries great numbers of Saxon youths and votaries of learning from different parts of the Continent passed into Ireland and resided in the monasteries. The Venerable Bede, mentioning the fact, relates that the monks charged their foreign pupils nothing for instruction, and even supplied them freely with food and books. The learning taught in these monasteries was derived partly from the Scriptures and partly from the literature of Greece and Rome. So, apart from religious and moral instruction, culture in these monasteries assumed quite a scholastic aspect. In spite of the fame, no doubt a well-deserved fame, of the Irish monasteries of this period, they produced no original literature if we except their biographies of the saints, which are curious rather than excellent. It is generally stated that the progress of the monasteries was checked by the ferocious plundering expeditions of the Norsemen in the 9th and succeeding centuries, but the better opinion is that the religious and scholastic mission of these institutions was exhausted before the advent of the Norsemen. The *Lives of the Saints*, produced at this time in great numbers, indicate low and contracted views. For example, it was generally taught

that at the Day of Judgment the men of Ireland would be judged by the Irish saints and, according to their decisions, consigned to everlasting weal or woe. This, of course, shows that monastic Christianity had undergone a radical perversion. The first Norse invaders directed their ferocity mainly against the monasteries. They seem to have been animated by religious zeal for the extension of the worship of Odin and Thor. Armagh and Clonmacnoise, the chief centres of Irish Christianity, they converted into the chief centres of the Norse religion, and in both places set up the worship of the northern gods. The Vikings, who at first assailed the country in a desultory fashion, later on submitted to the control of a powerful sea-king, whom the Irish historians call Turgesius, a Latinised form of Thor-gils (Servant of Thor). Turgesius was almost certainly the famous Ragnar Lodbrog. Turgesius having now the exclusive control of the sea, presently made himself also Ard-Righ or High King over all Ireland. Norse power, however, gradually declined, so that eventually the Norsemen, having established walled cities at the mouths of all the great rivers, were satisfied with the monopoly of the carrying trade of Ireland. Eventually the Northmen of Dublin, in union with their kinsmen of Northumbria and the Hebrides, made a desperate attempt to re-establish Norse dominion in Ireland. They were defeated at Clontarf by Brian Boru, the Irish king. This was the greatest battle fought anywhere in the Viking period, and the fame of it went over all northern lands. For two and a half centuries now the Irish were left to themselves. There were ceaseless wars between the great dynastic families of the island, but before the advent of the Normans none of these families succeeded in establishing a clear right to the sovereignty. Under these circumstances Dermot M'Murrough, King of Leinster, was expelled from Ireland by a coalition of all the other kings under the command of Roderick O'Connor, King of Connaught, who then possessed the dignity of Ard-Righ. The exile, fleeing to Wales, came back leading with him a gallant body of Norman gentlemen, chief of whom was Richard de Clare, surnamed Strongbow. Strongbow's Normans and Dermot's Leinstermen made such rapid progress that the conquest of all Ireland by them seemed almost a mere question of time. Owing to the hostility with which the Irish *reguli* regarded each other, it began to seem probable that they would end by accepting the dominion of Strongbow as supplying a new and better basis of sovereignty. Henry II. took the alarm. He collected an enormous fleet and army, came to Ireland, and was accepted by the *reguli* as "lord" of all Ireland. Henry II. divided the island into great Palatinates under a new race of Norman nobles such as Hugo de Lacy, John de Courcy, William de Burgo, and others. These new lords had the *reguli* under their control, many of whom were quite loyal to their Norman superiors, and gave them faithful service. Henry II., however, feared to give any of these lords any considerable power over the rest. So did the Plantagenet kings who succeeded him. The consequence was that wars arose between these great Norman Palatinate

lords, under stress of which the Norman system, which at one time seemed promising, crumbled away, and the old Irish families of noble or kingly origin revived and became powerful. A great destruction, too, fell upon the Norman noblesse during the ruinous invasion of Ireland by Edward and Robert Bruce in the 14th century.

So at the commencement of the Tudor dynasty Ireland was quite ungoverned. The country was divided between some sixty great lords, Norman nobles and Irish chieftains. The 16th century was the grand turning-point in Irish history. The Crown now came into collision with these lords. The lords, though generally incapable of combination, were an able and warlike race of men, and fought strenuously to maintain their independence against the encroachments of the State. The smaller lords, however, and the gentry of the country were, on the whole, hostile to the great lords and friendly to the Crown; also all the walled cities, inland and seaboard, were enthusiastically devoted to the State. Of the rebellions of the dynasts, the greatest by far was that of which Hugh O'Neill, Earl of Tyrone, was leader. He succeeded in combining all Ulster against Queen Elizabeth, and, but for the intense hostility of the rest of Ireland, would certainly have triumphed. Throughout all these sixteenth century convulsions Ireland as a whole co-operated with the Crown. In fact, everywhere over Europe about this time, whenever the Crown came into collision with the great feudal lords, we find the people in general siding with the former. Eventually all the great Irish lords were subdued or exterminated, after which for the first time in her history Ireland enjoyed the blessing of universal peace. It was during this period that James I. carried out the plantation of Ulster. Peace was interrupted in the reign of Charles I. by a rebellion, the leaders of which pretended that they rose for the purpose of supporting that king's authority, which was at that time menaced by the Parliament of England. This rebellion was attended by a massacre of the Protestant planters of the north. Bad as was this business, it hardly surprises one who is familiar with the convulsions of the 16th century, when the massacre of non-combatants was so common as to be regarded as almost a necessary incident of war, like the destruction of growing crops and the slaughter of cattle. A period of great civil strife and confusion now succeeded. Three or four distinct parties appeared, all in arms, and much blood was shed. Eventually the Marquis of Ormonde combined all Ireland against the English Parliament in support of the rights of Prince Charles, afterwards Charles II. Parliament sent Cromwell to Ireland, who in a few months broke the Royalist confederacy to pieces. Huge confiscations now followed, and the remnant of the Royalist gentry were driven over the Shannon and confined to the province of Connaught. A second period of peace succeeded under a Puritan régime. Industry and trade flourished, and Ireland, as to her national interests, made rapid progress. When later on the English people revolted against and drove out James II., the Irish people combined to support him. Their hopes of maintaining the lost

cause of the Stuarts were frustrated by the battle of the Boyne, where the Irish Jacobites were defeated by William III. King James, who was present, fled out of the battle and made off for France in a rather scandalous fashion. The Irish, though deserted by their king, fought on with great gallantry, but could not make head against the vastly superior forces which William was able to direct against them. The Catholic noblesse now quite lost their estates, and almost to a man passed over to the Continent as professional soldiers, taking service chiefly under the King of France. Many of these exiles distinguished themselves greatly on the Continent. A Protestant aristocracy succeeded them in Ireland, and governed a Catholic population which was quite docile and submissive. The latter had no political rights and few civil, and were still further depressed by the enactment of penal laws of a very harsh and tyrannical character. While the Protestant aristocracy governed the people, they were themselves governed from London. They were satisfied with this arrangement, but as time went on became more ambitious. In 1782, finding themselves a power, and even a military power, they declared the legislative independence of their Parliament. The subject Catholic population now began to agitate for political rights. Their claims being resisted by the aristocracy led to the bloody rebellion of 1798. This rebellion precipitated the Act of Union, which was passed in 1800. The Catholics hoped to get better treatment from the Imperial Parliament, and the aristocracy began to fear that, though they had triumphed in 1798, they might be overborne and destroyed in the next revolutionary movement by the people. The subsequent history of Ireland merges in that of Great Britain. The most notable events have been the Catholic Emancipation Act of 1829, due to the courage and persistency of the great agitator, Daniel O'Connell, the rise and the progress of the Home Rule movement, and the remarkable agrarian legislation to which attention has been already directed.

The constitutional history of Ireland resembles in its main features that of England. Before the Conquest the chronicles frequently refer to great conventions of the laity and clergy for the enactment of laws. These assemblies were not representative, but similar to those general assemblies of freemen common to all the northern nations of Europe. They were summoned, however, and presided over by the *Ard-Righ*. After the Conquest the kings of England frequently convened assemblies of a parliamentary character resembling those which they convened in England. The Christmas banquet to which Henry II. invited all his Norman and Celtic feudatories—an event referred to in all the histories—was probably an assembly of that nature. Records of writs summoning the feudatories have been preserved dating as early as the reign of King John. These writs are addressed not only to the usual classes of persons then summoned to great councils, but to knights, citizens, merchants, burgesses, and freeholders. Later on it is evident that only those of English origin were summoned to such assemblies. In the

reign of Edward I. the principle of elective representation of the Commons was introduced, the sheriffs (1295) being directed to cause two good and discreet knights from each county to be chosen at a full assembly of the freeholders. This assembly may be regarded as, rightly speaking, the first Irish Parliament. In 1311 the election principle was extended to boroughs. From this time forward, however, the authority of the kings of England was greatly reduced, so that the succeeding Parliaments represented only a small portion of the provinces of Meath and Leinster called the Pale. In the 16th century, with the revival of royal authority, Parliaments assumed a corresponding dignity. In 1541 a Parliament was held in Dublin which included not only the Norman nobles, but all the principal Irish chieftains. The object with which that assembly met was to confer the title of King of Ireland upon Henry VIII., the kings of England from the time of Henry II. having been only lords of Ireland. Another important Irish Parliament of this century was that which is commonly called Perrott's Parliament. It was held in 1585, and was also representative of the whole of Ireland. For twenty-seven years after this there was no Parliament, but in 1613 James I. summoned another also representative of all the nation. Lest the native Irish should control the assembly, King James had enormously increased the representation of boroughs, taking care that the new parliamentary boroughs should be those occupied by English and Protestant settlers. Generally speaking, the parliamentary arrangements now made by King James lasted down to the Union. Though most of King James's boroughs never became more than hamlets, the Irish Parliament continued to be dominated by the borough interest. Of course these boroughs were bought and sold, and continued to fetch prices that increased from year to year. Under the Plantagenet and Tudor dynasties. Irish Parliaments, though sometimes a little restive, on the whole recognised in the Imperial Parliament a right to make laws binding in Ireland, while denying the right of the Imperial Parliament to tax the smaller country. In the reign of Charles I., the Imperial Parliament having expressly asserted a claim to make laws binding Irishmen, the Irish House of Commons passed an unanimous resolution that "his Majesty's subjects in Ireland are a free people, and to be governed only according to the common law of England and the statutes made and established by Parliament in Ireland." As both Parliaments were presently overthrown by Oliver Cromwell, this constitutional collision led to no further developments. Cromwell, it may be observed, summoned thirty persons from Ireland to his first Parliament. Something of the same nature had been done once before—*viz.*, by Edward III., when he desired to get a subsidy from Ireland. On that former occasion the Irish obeyed but protested against the innovation. The international dispute so heralded produced no fresh developments till about the year 1750. The Irish Parliaments were conscious of weakness and dependency, and all friction was avoided by the operation of Poyning's Law. This law, made at the close of the 15th

century, deprived Irish Parliaments of the right to make laws without the previous consent of the Imperial Government. From 1750 to 1800, the date of the Union, the two Parliaments were in perpetual collision. The Union, of course, ended that controversy, which, however, in a different form, has been revived in our time, and given birth to the Home Rule movement.

Literature. The literary history of Ireland is interesting and peculiar. Published or unpublished, there still remains a vast amount of indigenous Gaelic literature seemingly of Pagan origin, and little, if at all, affected by Christian influences. It consists of ancient poems and of tales which have been evidently built up from pre-existing metrical cycles, the original verse showing through the more modern prose at many points. It represents the work either of the Christian bards or of a literary class of Christians perhaps, but dominated by influences descending out of the Pagan times. This literature is concerned mainly with the achievements of famous kings and warriors, is of enormous extent, and of great but rude excellence. It celebrates the simple cardinal virtues, and in many respects anticipates the chivalrous literature of later times. The most ancient collections of this curious literature were made before the Norman Conquest, and are contained in two celebrated manuscripts called the *Leabar-na-Huidré* and the *Book of Leinster*, which were written respectively in the 11th and 12th centuries, and are still extant. These books are, in fact, great collections of folk-lore. Many other collections have been made since, and it is worthy of notice that many tales written down quite recently from the lips of Gaelic-speaking peasantry in Ireland and in the Hebrides are almost as antique in their character as those pre-Norman compilations. The literary creative impulse was seriously checked by the introduction of Christianity, and the intellectual predominance of the monasteries, in the 5th and succeeding centuries. The bardic classes, however, continued to do their proper work side by side with the representatives of monastic learning. The Irish monasteries, whose intellectual life was dominated by the literature of Greece and Rome and by religious influences, produced no original work. The genius of scholasticism is not creative; the work of the Irish monasteries during the centuries of their fame lay rather in the direction of study than of production. They produced numbers of learned men, but, in Ireland at least, no great writer. On the other hand, many Irishmen trained in the monasteries became famous as writers after they had left Ireland and participated in the intellectual life of the Continent. The most famous of these men were Columbanus, Scotus Erigena, Duns Scotus, and Vergil "the Geometer." Irish monastic and bardic culture both received a fatal blow in the Norman Conquest, which, indeed, was not so much a conquest as a social and political revolution. The country generally at this time shook off all old associations, and adopted new ones more in harmony with the prevalent spirit of Europe at that time. Under the Norman *régime* there was no literary production. Monastic life was purely religious or

academic, and, though the bardic classes survived and to some extent even flourished, they confined themselves rather to the study, transcription, and preservation of the ancient heroic and romantic literature composed by their predecessors. The Tudor conquest of Ireland in the 16th century, which was also, and in a still more marked degree, a revolution rather than a conquest, was the death-blow of the bardic fraternity. The complete overthrow, extermination, or degradation of all the old dynastic families of the island, and the universal assertion of the authority of the Crown and the dominance of English law, rendered the cultivation of Gaelic literature a thing of the past. The Tudor conquest decided that Ireland should be an English-speaking country. In the reign of James I. the expiring Celtic civilisation uttered what might be called its "swan-song" in the noble literary work called *The Annals of the Four Masters*. It is a history of Ireland written by representatives both of the monastic and bardic classes, and breathes throughout a blended spirit of piety and heroism. If all other Gaelic literature were destroyed, *The Annals of the Four Masters* would exhibit in a very remarkable manner all the leading traits and features of Irish Celtic civilisation. Henceforward the literary spirit of Ireland began to express itself in the English tongue. During the 17th century the conflict of the two languages prevented anything notable being effected in either. In the 18th century, the victory of the English language and the English form of civilisation being complete, Ireland began again to produce literary men and original literature. The first representative of Anglo-Irish literature was Laurence Sterne. Sterne's *Tristram Shandy* marks the commencement of a quite new order of literature. From *The Annals of the Four Masters* to *Tristram Shandy* there is a gulf of separation as great as that which divided the Protestant English-speaking and law-abiding Irish gentlemen of the 18th century from the rude but brave, warlike, magnanimous, and religious feudal Irish dynasty of the 15th and 16th centuries. The student who passes from one of those books to the other will feel at once the great revolution of thought and sentiment which had taken place in the interim. Besides Sterne, Ireland in this century produced two great writers, Burke and Goldsmith. The 19th century opens with the name of Thomas Moore, whose Irish melodies, though often assailed by critics, certainly possess an endearing charm. After Moore a brilliant school of novelists appeared on the scene, the chief of whom were Carleton, the describer of Irish peasant life, and Lever, the gay delineator of the manners of the Anglo-Irish gentry. Even the minor writers of this school wrote with much eloquence and spirit. During the rebellious movement of '48 a number of brilliant literary men appeared: Darcy McGee, John Mitchel, Gavan Duffy, Thomas Davis, and others, some of whose work, especially their songs, seem likely to live. In our time Anglo-Irish literature shows a tendency which may culminate in a school of Irish historical romance or a literary presentation of Irish history.

Ethnology. According to the national traditions, confirmed by archæological research, Ireland was

already occupied by an aboriginal population before the arrival of the Celts, who have formed the bulk of the inhabitants from remote prehistoric times. These Celts belong to the Gadhælic, or elder branch [CELTS], and are fabled to have come from Spain under a mythical leader, Milesius (hence known as "Milesians"), at some unknown epoch. Both elements, represented by the two types of skulls found in cairns and barrows, still survive, the pre-Celtic chiefly in the West (Kerry, Cork, Connaught, Donegal), the Celtic in the central and south-western districts. The former is distinguished by long heads flattened at the temples, small and slightly snub nose, very long upper lip, large cheek-bones, black hair, swarthy complexion; the latter by round heads, grey or blue eyes, and fair hair. Elsewhere the populations have long been of a mixed character, the prevailing elements being Dano-Celtic in the sea-ports (Limerick, Cork, Waterford, Dublin); Anglo-Celtic throughout Leinster and East Munster, often indicated by the combination of blue eyes and black hair; Scoto-Celtic in the north-east of Ulster since the beginning of the 17th century. Although most of the island was converted to Christianity in the 5th century, and became a chief seat of ecclesiastic learning and monasticism during the four following centuries, prehistoric usages long survived in some of the more remote western districts, and the Inish-kea islanders, off the Mayo coast, were still almost pagans till about the year 1870. In some parts of Connaught and Donegal the people, representing the primitive pre-Celtic element, have retained an almost savage aspect, characterised by small eyes, flat features, low brow, bristly hair, and a quasi-Mongolic cast of countenance. But generally speaking the Irish, when not debased by hardships and a poor diet, are a fine race, handsomer and of more graceful carriage than the English or Scotch, while the women are unsurpassed for dignity and self-respect. Even in some of the western districts, such as Joyce's Country, Connemara, the men are remarkable for their gigantic size and herculean frames; and those of Tipperary, though somewhat smaller, are equally muscular and powerful, with nimble, graceful action. The mental qualities are distinctly Celtic, marked by great quickness, ready wit, brilliant fancy, an innate sense of art, and a well-developed musical faculty, combined with a lack of perseverance, a sanguine, impulsive temperament, fickleness of purpose, and generally a decided preponderance of heart over head. The Irish language, which possesses a literature rich especially in historic and legendary matter (records, annals, myths, folk-lore), has steadily declined since the 16th century, when debates were still carried on in Irish in both chambers down to the death of Henry VIII. (1547). O'Culanne, author of a superb elogy on the ruins of Timoleague, County Cork, was the last spontaneous Irish poet, and the *History of Ireland*, by Dr. Keating (ob. 1644), was the last serious Irish prose work. The language has ceased to be cultivated since about 1700, although Archbishop M'Hale of Tuam translated Homer and Moore's Irish melodies about the middle of the present century. It received its

death-blow from the famine of 1846-47, and in 1881 it was still spoken by not more than 950,000, exclusively in the western districts.

Ireland, SAMUEL WILLIAM HENRY (1777-1835), was articled to a conveyancer, and began at an early age to forge and cleverly utter remains of Shakespeare, as his father had a craze for discovering some scrap of the great dramatist's handwriting. Amongst his spurious documents were contracts between Shakespeare, Lowine, and Condell, a deed of gift to William Henry Ireland, a deed of trust to John Hemynge, a Protestant confession of faith by Shakespeare, letters to Anne Hathaway, and others, a new version of *King Lear*, and an original drama, *Vortigern and Rowena*, which Garrick produced at Drury Lane. He was exposed by Malone, and his drama broke down on its first performance. The rest of his life was passed in comparative obscurity and poverty. He published a full confession of his forgeries (1805).

Irenæus, ST., pupil of Polycarp and Papias, was presbyter, and, later on, Bishop of Lyons, at the end of the 2nd century. His opposition to heretics was very violent. Of his works, the first book of the *Libri V. adversus Haereses* only remains in the original Greek; the rest are translations. He suffered martyrdom (after 202) in the persecution under Septimius Severus, and was canonised, his day being April 6th.

Ireton, HENRY (1610-1651), a celebrated Parliamentary statesman and commander in the Civil Wars of Charles I., was of good family, and was educated for the law; but on the commencement of the wars he joined the Parliamentary Army, and soon, by the influence of Cromwell, whose daughter Bridget he married, rose to be commissary-general. He commanded the left wing at Naseby, and was wounded and taken prisoner. On recovering his liberty he was largely responsible for the measures which placed the Parliament under the power of the army, and had a principal share in making the ordinance for the king's trial, at which he was himself one of the judges. He accompanied Cromwell to Ireland (1649), and being left by him as Lord Deputy, reduced the Irish to submission with much rigour. He died at Limerick. He was distinguished for vigilance, capacity, and a stern zeal for justice which even amounted to cruelty. After the Restoration his body was exhumed and suspended on a gallows.

Iridescence, the colour effects produced when reflected light is viewed from finely-grooved surfaces. The slight irregularities cause a difference in phase of the light reaching the eye, and interference (q.v.) results. Part of the light is quenched, and remaining colours alone produce their effects, which evidently vary when viewed from different points. Mother-of-pearl and shot silk exhibit the phenomenon very well.

Iridium (Ir.), a rare metallic element which occurs in small quantities in ores of platinum (q.v.), which metal it very closely resembles. It is a white lustrous metal, brittle, and very heavy, possessing the specific gravity of 22.4. It forms

numerous salts, the *iridous* and *iridic* salts, corresponding respectively to the oxides Ir_2O_3 and IrO_2 . Its atomic weight, according to the best determinations, is nearly 193. Owing to its rarity, it is not extensively used; but, alloyed with platinum, it forms a most durable, hard, elastic metal, which was employed for production of standard measures of length, and is used (or a similar alloy with *osmium*) for parts of physical apparatus where great hardness and almost absolute permanence is necessary.

Iris. In classical mythology, a personification of the rainbow. In the *Iliad* she is the messenger of Zeus, Hera, and other Olympian deities. She is regarded as the daughter of Thaumas (son of Gæa) and the Oceanid Electra, and sister of the Harpies. In art she is represented with wings on her shoulders and with a herald's staff; sometimes also with a pitcher.

Iris. A genus of Monocotyledons, giving its name to the order Iridaceæ. They are perennials

having generally fleshy rhizomes, equitant sword-shaped leaves, and showy flowers presenting a wide range of colours and markings, which render them great favourites in gardens. They have a three-chambered inferior ovary with central placentation and numerous ovules; a perianth of six segments united below, the three outer reflexed and often furnished with a median beard-like outgrowth, the three inner erect, and often smaller; three epiphyllous extrorse stamens, their anthers over the beards; and the three carpels superposed (q.v.) upon them.



IRIS.

The columnar style divides into three spreading petaloid segments, each terminating in two triangular points, below which, and just above the anther, is the crescentic stigma. The species of the genus are natives of the north temperate zone, two being British. The rhizome of *I. florentina* has the odour of violets, and is used under the name of *Orris-root* in perfumery. It is imported from Leghorn, Trieste, and Mogador. The Florentine lily and the French fleur de lis are both taken from the iris.

Iris. [EYE.]

Irish Sea, the sea bounded on the E. by N.W. England and Wales, on the N. by Galway and the North Channel, on the W. by Ireland, and on the S. by St. George's Channel.

Iritis. The relations of the iris to the pupil of the eye render the condition known as iritis or

inflammation of the iris of very grave significance as affecting sight. In cases where effused lymph is allowed to contract adhesions with the underlying capsule of the lens, distortion of the aperture of the pupil results, and there is a continual tendency to a recurrence of succeeding attacks of iritis after the initial inflammation has passed away. Iritis is particularly apt to appear in association with syphilis; a rheumatic form of iritis is also described. The disease may be the result of injury, and may occur in connection with disease of adjoining structures in the eyeball. In the treatment of iritis atropine is largely used; by dilating the pupil it removes its inner margin from the neighbourhood of the capsule of the lens, and so prevents the formation of adhesions. The internal administration of drugs is determined by the constitutional condition upon which the iritis depends.

Irkutsk, capital of the Russian government of the same name, lat. N. $52^{\circ} 16' 4''$, long. E. $104^{\circ} 11' 41''$, situated on the river Angora, a flourishing town, carrying on a considerable commerce with China, Kamtschatka, Siberia, and Russia. The government of Irkutsk constitutes the Russian frontier towards China. The climate being cold and the winters long, travelling is difficult, except in the height of summer. The inhabitants are chiefly Russians, Tartars, and Mongols.

Irnerius, HIRNERIUS, WERNERIUS, WARNERIUS, GUARNERIUS (died before 1140), a distinguished jurist of Bologna, taught in the early years of the 12th century. He founded the school of *glossators* by his diligent studies of the Institutes and code of Justinian.

Iron (Fe.—At. Wt.=56) is at present the most important of all the metals which are known to man, and is that which finds the greatest application for manufacturing and general purposes. It has been known since early times, and was manufactured several centuries before the present era, many references to it occurring in the Bible and in many of the ancient classical writings. Free iron of terrestrial origin occurs only to a very small extent, being present in some volcanic rocks. In *meteorites*, however, large quantities of iron occur, both almost pure and associated with considerable quantities of *nickel* and other elements. In a state of combination, however, iron occurs very extensively, being one of the most abundant elements in the earth's crust. The chief natural compounds and ores of iron are the various *oxides*, as *magnetite* or magnetic oxide, Fe_3O_4 ; *hæmatite* and *specular iron ore*, Fe_2O_3 ; *brown hæmatite*, *limonite*, and other compounds of hæmatite with varying quantities of water; the *carbonate*, which forms chief constituent of a number of ores, as *blackband*, *clay ironstone*, *spathic iron ore*, etc. Besides these, which serve for the extraction of the metal, others occur as *pyrites*, FeS_2 , arsenical pyrites and numerous silicates of iron which occur in many minerals and rocks, especially in that class known as *basic* rocks. From these ores, after *calcination* (q.v.), i.e. heating to expel moisture, etc., the iron is obtained by a process of reduction or deoxidation by means of carbon, coal being usually employed, while lime is

also added to act as a flux. The carbon and the oxide of carbon, CO, produced by its incomplete combustion, unite with the oxygen of the ore, forming carbon dioxide, which escapes from the mouth of the huge *blast-furnace* (q.v.) in which the operation is performed. The lime combines with the earthy matter to form a fusible slag, which floats on the molten iron at the bottom of the furnace and is drawn off from time to time. The *exact* nature of the chemical changes is, however, even yet not completely understood. The iron so obtained is by no means pure. It is known as *pig iron* or *cast iron*, and contains as impurities small quantities of phosphorus, manganese, silicon, etc., and about 3 to 5 per cent. of carbon, which is present partly combined and partly disseminated through the mass, the differences in this respect causing the varieties of cast iron known as the *white* and the *grey*. It possesses a sp. gr. of 7.1 to 7.5, melts at about 1500° C., and has the peculiar property of expanding slightly on solidification, a property which is very useful in *casting*, the purpose to which this form of iron is chiefly applied. It cannot be employed for forging owing to its brittleness, neither can it be welded. From cast iron, *steel* may be obtained by the removal of the phosphorus, sulphur, etc., and part of the carbon present. The process by which this is done is known as the *Bessemer process* (q.v.), or the modification due to Thomas and Gilchrist [BASIC STEEL]. Formerly steel was obtained from *wrought iron* by the *cementation* process (q.v.), which has, however, become practically obsolete since the introduction of the former processes. *Steel* consists of purer iron than cast iron, as many of the impurities have been completely eliminated and the percentage of carbon is reduced to 1 or 1.5. It has a specific gravity of 7.6 to 8, and melts at a higher temperature than cast iron, 1800° C. If melted and cooled rapidly steel becomes very hard and brittle, but if slowly cooled it becomes softer, more ductile, and tenacious, and may be worked and forged. It is the only form of iron used for the manufacture of cutlery, etc.

Wrought iron is obtained also from cast iron, the process of eliminating the carbon being accomplished by melting the iron and exposing the molten mass to blasts of hot air, and afterwards again melting the iron so obtained with addition of small quantities of oxide of iron, and thoroughly stirring the mass—*puddling*—until it becomes of a pasty consistency. Wrought iron is in some places also produced directly from the ore, but not to a large extent. Wrought iron contains only about .2 to .5 per cent. of carbon, it has a sp. gr. of 7.6, is very tough, ductile, and malleable, so that it can be readily worked and forged. It has a higher melting-point than steel or cast iron, but possesses the property of entering into a pasty condition before it melts, so that it can be *welded* at a white heat.

Pure iron is almost unknown, being very difficult to obtain. The purest form is obtained by reducing the oxide in a stream of hydrogen, and it then forms a greyish powder which ignites with a sp. gr. of 7.8 if shaken into air. In contact with moist air

all varieties of iron rust, a coating of the oxide and hydroxide being formed. To prevent this it may be coated with zinc—*galvanised iron* (q.v.)—or with tin—*tinplate*. It possesses the power of being attracted by magnets, becoming itself simultaneously endowed with magnetic properties. Iron, however, soon loses this magnetisation, but steel retains it more permanently. Steel is hence used for magnets, while iron is used for manufacture of the electro-magnets in dynamos, etc. In acids iron dissolves, yielding *salts* of iron, of which two series exist, the *ferrous* (q.v.) and *ferrie* salt (q.v.). It forms a number of oxides known as *ferrous oxide*, FeO, *ferrie oxide*, Fe₂O₃, *magnetic oxide*, Fe₃O₄, while some compounds appear to contain an oxide of composition FeO₃ which does not exist free. Besides the innumerable uses to which iron in its different forms is applied, the salts and compounds are also largely employed for technical and medicinal purposes. Thus the sulphide—*pyrites*—is largely used as a source of sulphur and sulphuric acid, while in dyeing, iron salts are extensively used as mordants, as also in the manufacture of ink and in tanning, *copperas* (q.v.) being the salt chiefly employed. The citrate of iron and ammonia, as also the citrate of iron and quinine, are very largely used in medicinal preparations, while the precipitated hydrate is also used as an antidote in cases of arsenical poisoning.

Iron Age, a term used to denote the period, or the civilisation of the period, when iron replaced bronze as the general material for tools and weapons. In all cases, however, the Ages of Stone, Bronze, and Iron did not all occur. In Africa the transition seems to have been directly from stone to iron implements, and it is within quite recent times that the use of the latter has spread to the Hottentots, whose legends enshrine the memory of the time when their ancestors used stone tools for cutting down trees. On the other hand, Mexico and Peru were in the Bronze Age, when the Spaniards invaded South America in the 16th century. The Iron Age cannot, of course, be referred to any definite period. The *Odyssey* speaks of the use of iron, though weapons and armour were generally of bronze. Iron is mentioned with copper in Babylonian and Egyptian inscriptions, and the British Museum possesses a piece of wrought iron from the masonry of the Great Pyramid. Among the Jews, Tubal Cain was the "instructor of every artificer in . . . iron" (Gen. iv. 22). The succession of the Stone, Bronze, and Iron Ages in Europe is well shown in the Swiss Lake Dwellings and in the burial-places of old Scandinavia. In the latter region the Iron Age seems to have commenced about 2,000 years ago, and to have lasted till Christian missionaries taught a higher culture with a purer faith.

Iron-bark, a name most generally applied to *Eucalyptus resinifera*, a large Australian tree with a hard bark, and a deep red, straight-grained, very hard and heavy wood, which is classed at Lloyd's as A1 for ship-building. From the stem Australian kino (q.v.) is also obtained.

Ironclads. [WAR-SHIPS.]

Iron-pyrites, the general name for the various mineral forms of iron-sulphide, so named from their having been formerly used instead of flint for striking a light. Of these, the two principal, *pyrite* and *marcasite*, both have the same composition, being bisulphides (FeS_2), giving off, when heated, fumes of sulphur, of which they contain 63 per cent., and ultimately fusing to a magnetic metallic bead. They also agree in hardness, being from 6 to 6.5. Pyrite crystallises in the Cubic system in cubes, pentagonal dodecahedra, or combinations of these forms, the faces being almost always distinctly striated parallel to the basal edges of the pentagons of the latter. It is brass-yellow, with a metallic lustre, often splendid, and a greenish streak; is perfectly opaque, even in thin sections; has a conchoidal fracture; and a specific gravity of 4.8 to 5.2. It resists the action of the weather, even after years of exposure. Marcasite crystallises in the Rhombic system; but occurs generally in aggregated masses known as *hepatic*, *cockscomb*, or *spear-pyrites*, sometimes forming rounded nodules of radiating fibrous crystals. It is a lighter brass-yellow than pyrite, whence it is sometimes called *white iron-pyrites*. Its specific gravity ranges from 4.6 to 4.9. It readily decomposes into iron-rust (hydrous oxide) on exposure to weather; so that the animal and vegetable fossils (q.v.), such as ammonites, cones, and fruits, which have often been entirely replaced by it, require protection from the ordinary moisture of the air, either by a marine varnish, or by being preserved in naphtha (that liquid containing no oxygen). It used formerly to be cut and polished as buttons, buckles, brooches, etc. Pyrite was employed in the old wheel-lock guns, a steel wheel revolving by clockwork against a piece of it, so that sparks fell into the pan, in which was some powder. Though, owing to the presence of sulphur, useless as ores of iron, both forms of pyrites are used in the manufacture of sulphuric acid, copperas, alum, and sulphur. Some pyrites contain gold in a proportion worth extracting. The "brasses" in coal are layers of pyrites, the nodular forms are common in the Chalk and Gault; the crystals of pyrite, in slate. *Magnetic pyrites*, or *pyrrhotine* (Fe_6S_7), crystallises in the Hexagonal system; has a coppery-brown tarnish, and a hardness of only 3.5 to 4.5, besides being magnetic and generally lighter than marcasite. *Arsenical pyrites*, or *mispickel* (q.v.), is rhombic, tin-white, with a coppery tarnish, and heavier than the others, besides giving off arsenical fumes.

Iron-stone, a general name for a number of ores of iron containing the oxides or carbonates, often with an admixture of sand, clay, limestone, or organic matter. They include the various more or less impure forms of hæmatite, limonite, siderite, clay-ironstone, and magnetite, which are here described under those separate headings.

Iron-wood, a name which, with its French equivalent *Bois de fer*, is applied to a considerable number of hard woods, belonging to various natural orders, but mostly natives of the tropics. Among them are various species of *Sideroxylon* (Sapotaceæ), *Metrosideros* (Myrtaceæ), *Eucalyptus* (q.v.), and

Olea; *Sloëtia sideroxylon* in the Malay Archipelago; and, in North America, the hornbeams, *Carpinus americana* and *Ostrya virginica*.

Iroquois, one of the main divisions of the North American aborigines, whose domain originally comprised the middle St. Lawrence basin with the shores of Lakes Ontario and Erie, the present State of New York and most of Pennsylvania, besides enclosures in Virginia, the Carolinas, and Tennessee, but nowhere quite reaching the Atlantic, being almost everywhere surrounded by various branches of their hereditary foes, the Algonquian people. The Iroquois proper, mainly centred in New York and the opposite side of the St. Lawrence, formed a renowned historic confederacy of five nations, afterwards (1712) increased to six by the accession of the Tuscaroras from North Carolina, the original "five nations" (*Ongwehonwe*, "Superior Men") being the *Mohawks*, founders of the union, the *Oneidas*, *Onondagoes*, *Senecas*, and *Cayugas*. The other branches of the Iroquoian race, some hostile, some friendly, were the Eries, "Neuters," and Wyandots (Hurons) of the lakes region; the Conestogas of the Lower Susquehanna, the Nottoways and Chowanoes bordering on the Tuscaroras, and the Cherokees of South Carolina. Physically the Iroquois were scarcely to be distinguished from their Algonquian neighbours, being of the ordinary Prairie Indian type; but mentally they were superior to them and to all other aborigines north of the Pueblo Indians (New Mexico and Arizona), as shown especially by their powerful political organisation, enabling them for generations to hold their own against all the surrounding Algonquians, by whom they were vastly outnumbered. They were also distinguished by their speech, a stock language of the normal polysynthetic type still spoken in several marked varieties on the reservations to which all the surviving tribes are now confined. They number (1893) altogether 43,000, of whom 34,000 are in the United States and 9,000 in Canada, the chief reservations being those of Indian Territory (Quapaw and other agencies), New York (Cattaraugus, Oneida, Alleghany, Tonawanda, and others), and Canada (Caughnawaga of Quebec, Quinte Bay, Grand River, and others of Ontario), besides the Green Bay Agency in Wisconsin for the Oneidas. The Eries, Conestogas, Neuters, Tionontates, and Wyandots are extinct. During the border warfare before the British conquest of Canada, the Iroquois usually took sides with the English, the northern Algonquians with the French. Since then the Iroquois have also accepted British culture, being mostly Protestants, and receiving instruction in English, while retaining the use of their several tribal dialects. They are of peaceful habits, and skilful agriculturists, raising much farm produce for the surrounding markets (Gallatin, in *Schoolcraft*, III. p. 401; Berghau's *Irokesen*, 1887; Bancroft, *History U.S.*, III. p. 243).

Irradiation is an effect of bright light on the retina of the eye. When a bright object is viewed its image is confined to a small area of the retina, but the effect of the disturbance of this area is not

quite confined to this limit. The neighbouring parts of the retina may also be disturbed, apparently by some sort of sympathetic action analogous to that of resonators in acoustics. Thus the brain receives the impression of an object larger than it actually is. This accounts for the greater apparent size of the sun when seen in a clear sky than when viewed through a fog. The thickness of the filament of an electric lamp when incandescent appears greater than when cold. Slenderness of a person may be disguised by white apparel, and *vice versâ*. The photograph of a lightning flash always makes it look much smaller than it naturally appears to be.

Irrational Numbers. [SURDS.]

Irtish, an Asiatic river famous for its sturgeon fisheries, which, rising on the south-west side of the Altai Mountains, forms Lake Zaisau and then flows into the government of Omsk. It then enters Tobolsk, passes the town of that name, and finally empties itself into the Obi, near Samarova.

Irulas. [ERULARS.]

Irving, EDWARD (1792-1834), founder of the sect of Irvingites, was born at Annan, Dumfriesshire, distinguished himself in mathematics at Edinburgh University; for several years he was employed as a mathematical teacher, until he became a licentiate of the Church of Scotland. After being associated with Dr. Chalmers at Glasgow in 1822, he became a minister of the Caledonian Asylum Chapel (Presbyterian), Cross Street, Hatton Garden. His eloquence and the eccentricity of his appearance, delivery, and doctrine, soon made him a most popular preacher, and his printed works were in great demand. In 1828 he formulated his peculiar tenets, and in 1830 proceedings were instituted with a view of turning him out of the ministry of the National Scotch Church. In 1832 he was deprived of the cure of the church in Regent's Square which his admirers had erected for him, whereupon his disciples bought the picture gallery of Sir Benjamin West, in which for about two years he promulgated his ideas.

Irving, HENRY (1838), theatrical name of JOHN HENRY BRODRIB, the most distinguished actor of the day. He was born at Keinton near Glastonbury, came out in 1856 at Sunderland, acted Hamlet with *éclat* in 1874, and became lessee of the "Lyceum" in 1878. He was well received in America in 1883, 1884, 1887, and following years.

Irving, WASHINGTON (1783-1859), a famous and popular American writer, was the son of a considerable merchant of New York, where he was born. He was educated for the Bar, but being delicate made the tour of Europe from 1802 to 1806, when he returned to New York and was called to the Bar. In 1809 he brought out his *History of New York* (by Dietrich Knickerbocker), which established his reputation as a man of letters, and joined his brothers as partner in their mercantile firm, which, owing to the cessation of hostilities between England and the United States in 1814, became bankrupt in 1817, while Irving was in England. He then determined to devote himself

to literature as a means of livelihood. Making London his headquarters, he produced during seventeen years' residence in Europe *The Sketch Book*, *Brackenbury Hall*, *The Life of Columbus*, *Chronicles of the Conquest of Granada*, and *Tales of the Shannon*, etc. Returning to New York in 1832, he was welcomed with acclamation, and continued his career as an elegant and popular writer. From 1842 to 1846 he was United States ambassador at Madrid. He then resided until his death at Sunnyside, a residence on the Hudson, 25 miles from New York.

Isaac Comnenus (d. 1061), son of MANUEL COMNENUS, a celebrated general, was the first Byzantine Emperor of that dynasty. Left fatherless at an early age, he and his brother John were well educated under the care of Basil II., and advanced to high honour. The soldiers, disgusted at the effeminacy of Basil, soon elected Isaac emperor. He abdicated after a two years' reign owing to the decline of his health, and was succeeded by Constantine Ducas, his brother John refusing the honour. He died in a monastery.

Isabella (1451-1504), the famous Queen of Spain, was daughter of Juan II., King of Castile. In 1469 she was married to Ferdinand V., King of Arragon, and in 1474, on the death of her brother, Henry IV., she was chosen by the estates Queen of Castile, to the exclusion of her elder sister. Her husband established her in her kingdom by his victory over her opponents at Toro, in 1476; whereupon Ferdinand and Isabella assumed the styles and titles of King and Queen of Spain. With the assistance of Cardinal Ximenes she brought about the conquest of Granada and the expulsion of the Moors from Spain; while she exalted the royal prerogative and promoted public order by quelling the insolence of the grandees and restraining their petty wars against each other. This was effected by the maintenance of unbending personal dignity qualified by prudent graciousness, of rigid etiquette at Court, and of rigorous administration of justice. She was largely concerned in the introduction of the Inquisition into Spain (1480), and in the more beneficent transaction of tardily furnishing Columbus with the means of discovering America (1492). Her daughter and heiress Joanna was mother of the Emperor Charles V. Isabella was a woman of remarkable talent and of indomitable energy and resolution.

Isabey, JEAN BAPTISTE (1767-1855), a famous French portrait painter born at Nancy. He studied under Dumont and David. He painted portraits of Napoleon I. and Josephine, and of all the successive rulers of France up to the date of his death.

Isæus (B.C. 420—abt. 348), one of the ten Attic orators, born at Chalcis, when still young went to Athens, where he studied oratory under Lysias and Isocrates. He established a school of rhetoric, and is said to have had Demosthenes as a pupil. It is supposed that he wrote, or helped Demosthenes to write, his speeches against his guardians. Nothing more is known of his life. Eleven orations remain out of the sixty-four with which he is credited. They

are on questions of inheritance, and throw much light on this branch of Attic law. His style is concise, clear, and forcible.

Isaiah (Heb. Jesaiah; flourished 8th century B.C.), the greatest Hebrew prophet, son of Amoz, was a citizen of Jerusalem, probably of high rank, since he addresses the king unbidden (vii. 4) and tells the most unpleasant truths without interference. He is supposed to have begun to prophesy about 740 B.C. He prophesied punishment for the people, sunk as they were in idolatry and unrighteousness, but declared that a remnant should remain, and foretold the coming of the Messiah. In ch. xxix.-xxxiii. he predicted the siege and deliverance of Zion, and in xxxix. foresaw the Babylonian captivity.

Isakkamaren (SAKOMAREN), a historical Tuareg people, the Segmaras of the early Arab writers, who in mediæval times occupied an extensive domain round about their stronghold of Tademekka, South Sahara. After the capture of this place, they were dispersed in various directions, some assuming the character of Marabouts (*anislamin*), while others sank to the condition of serfs to some of the noble Tuareg tribes. One group migrated northwards, and joined the Ahaggar confederacy in the capacity of traders on the caravan route between Twat and Ghadamas.

Isambert, FRANÇOIS ANDRÉ (1792-1857), born at Aunay, was a French lawyer. He began to practise as an advocate at the Court of Cassation in 1818, and speedily became known as a political advocate opposed to the Restoration Government. He gained much reputation by publishing *Recueil Général des Anciennes Lois Françaises, Code Électoral et Municipal*, etc. In 1830, after the July revolution, he was appointed councillor of the Court of Cassation and a member of the Chamber of Deputies. He belonged, till 1848, to the Constitutional Opposition, and showed himself friendly to liberty and hostile to the Jesuits. He also wrote *Histoire de Justinien*, etc.

Isandhlwana, or ISANDULA, 110 miles N. by W. of Durban, is on the left bank of the Buffalo river, in Natal. Here on January 22nd, 1879, 4 companies of the 24th and some native troops, under Colonels Durnford and Pulleine, were nearly annihilated by 18,000 Zulus, the British loss being over 800, that of the Zulus 2,000.

Isar, a Bavarian river, rises in the Tyrol, N.E. of Innsbruck, and flows into the Danube near Deggendorf, after a course of 220 miles, passing Munich and Landshut. Much timber is floated down the Isar from the mountains.

Isatin. If nitric acid be added to a boiling decoction of indigo, the blue colour is gradually destroyed, and from the liquid can be crystallised out yellow prisms, which are soluble in water, alcohol, or alkali solutions, yielding in the latter a violet solution. These are *isatin*, a body of composition $C_8H_5NO_2$, and of the constitution represented by $C_6H_4 \begin{smallmatrix} \diagup CO \\ \diagdown N \end{smallmatrix} C \cdot OH$. It is of very great chemical importance, as by means of suitable reactions indigo

may be prepared from it, and as it can also be obtained by numerous synthetic reactions, it affords the means of the complete synthesis and artificial preparation of this important dye; while otherwise also it is of great interest and importance in pure and applied chemistry.

Isauria, in ancient geography a district of Asia Minor on the summit and northern slopes of Mt. Taurus, inhabited by a savage race of robbers which died out after the 5th century.

Ischia, an island on the north of the Bay of Naples. The chief towns are Ischia, Casamiccola (destroyed twice by earthquakes, 1881 and 1883), and Jorio.

Ischl, a town in upper Austria, 33 miles E. by S. of Salzburg, on the river Traun, is famous for its saline baths, established in 1822. It manufactures 8,000 tons of salt every year.

Isère, a river which gives its name to a department in France, surrounded on the north and west by the river Rhone. Area, 3,200 square miles. The manufactures include iron and steel goods, gloves, cloth, straw hats, liqueur (*chartreuse*), etc. The capital is Grenoble.

Isidore, of Seville (560-636), a very celebrated ecclesiastic and compiler of glosses at the beginning of the 7th century, was born at Carthagenæ, where his father Severianus was prefect, or at Seville. He succeeded Leander as Bishop of Seville (600). He presided at two half-ecclesiastical, half-civil councils at Seville (618 or 619), and at Toledo (633), when the bases of the constitution which lasted down to the 15th century were laid. In the eighth council at Toledo the title *egregius* was conferred on him for his great learning and devotion to literature. His most important work, *Originum sive Etymologiarum Libri xx.*, is an epitome of an encyclopædia.

Isinglass, a substance possessing the same composition as gelatine (q.v.), is obtained from the air bladder of various fishes. It comes into commerce as *pipe* or *purse* isinglass, which are merely the dried bladder; *leaf* isinglass, the opened bladder; or *ribbon* isinglass, cut into strips and rolled out. It is obtained chiefly from Russia, Brazil, and the Hudson Bay territory. It is employed for a variety of purposes. Large quantities are used for clarifying beers, light wines, and other liquids. Much of the best varieties is employed for confectionery, while it is also used for the manufacture of court plaster, marine glue, cements, etc. It is frequently adulterated with ordinary gelatine, and the detection of such fraud is only accomplished with difficulty and by careful examination.

Isis, in Egyptian mythology the Moon-Goddess, sister and wife of Osiris and mother of Horus, was daughter of Seb (the earth) and Nut (the sky). She was the patron goddess of women. Originally she was goddess of earth and agriculture. In art her attributes are the lotus flower as a head-dress, and the sistrum in her right hand. In Greece she was identified with Demeter and Io, and modified forms of her worship prevailed extensively. Her

worship with orgiastic mysteries was introduced into Rome in Sulla's time, and, in spite of the



opposition of first the Senate and then Augustus, became very popular.

Isla, JOSE FRANCISCO DE (1703–81), Spanish humorist, satirist, and preacher, early in life joined the Jesuits and lectured on philosophy and theology at Segovia, Santiago, and Pamplona. He became a famous preacher, and made still more sensation by his novel, *Friar Gerund* (1758), which was aimed at the charlatanism of the popular preachers of the day. He was struck with paralysis (1767). His works include *Youth Triumphant* (1727), *Letters of Juan de la Encina* (1727), and a translation of *Gil Blas*.

Islay, an island in Argyllshire, has an area of 246 square miles, and lies 13 miles W. of Kintyre and half a mile S.W. of Jura. It contains several fresh-water lakes. The leading industries are dairy-farming, stock-raising, and whisky distillation.

Islington, a London suburb $2\frac{1}{2}$ miles N. of St. Paul's, forms part of the metropolitan area. It has many benevolent institutions. The National Cattle and Horse Shows are held in the Agricultural Hall, which will contain 50,000 persons. Since 1885 Islington has returned four members of Parliament, being divided into four constituencies.

Ismaelites, the Bedouin or nomad element in Arabia, in contradistinction to the Kahtanides, or settled population, of Yemen; are traditionally regarded as *Arab el-Mostarebah*, that is, mixed Arabs, the issue of an alliance between Ismael and a woman of Kahtan stock. They are commonly known as Maadites, from Maad, a descendant of Ismael, and to this connection are referred the Nabothians, Kedarenes, Edomites (Idumeans), Amalekites, Moabites, Ammonites, and Midianites of the Biblical records. The Ismaelites hold the

Kahtanides in contempt, calling them Ahl-el-Madar, that is, "House People," because they dwell in towns and not in tents. Their speech is the classical language of the Koran and of Arabic literature, Mohammed having been an Ismaelite of the Koreish tribe.

Ismail, a town and river port in Russia. Formerly a Turkish fortress, it was taken by Suwaroff (1790), came into possession of Russia (1812), was assigned to Moldavia (1856), and transferred to Russia by the Berlin Congress (1878). Trade—corn, wool, tallow, and hides.

Ismailiyeh, a tribe occupying the eastern slopes of the Ansarieh Mountains, North Syria. They claim direct descent from the famous sect of the "Assassins," whose characteristic teachings they have, however, long ceased to practise.

Iso. [ISOMERISM.]

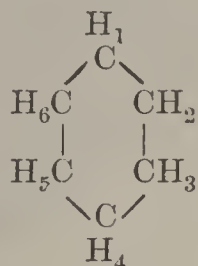
Isobars, in meteorology, are lines of equal atmospheric pressure. Barometric readings are taken at a large number of stations all over the earth; their average value at every station, during a certain interval, is carefully calculated; and lines are drawn on a map of the world, each line passing through those points where the pressure has been the same during the period specified. Study of these isobaric lines helps considerably in determining the cause of prevalent winds.

Isoclinic Lines, in magnetism, are lines drawn through those points on the earth's surface where the magnetic inclination is the same. Similarly *isogonic* lines show the points of equal magnetic declination, and *isodynamic* lines the points of equal magnetic intensity.

Isocrates (B.C. 436–338), one of the ten Attic orators born at Athens, was the greatest "epideictic" orator—i.e. a composer of show-speeches and model orations, to whom literary finish and form and rhetorical effect were all-important. He was the son of a wealthy flute-player, Theodorus, who gave him an excellent education, and when still young he studied under Tisias and the first epideictic orator, Gorgias, and also under the sophist Prodicus. He was not himself a public *speaker*, but wrote 60 speeches, of which 21 (8 only for law-courts) are extant. About B.C. 390 he began to teach rhetoric, and instructed a hundred pupils, amongst whom were Timotheus, Laodamas, Ephorus, Theopompus, Isæus, Lycurgus, Æschines, and Hyperides. His greatest speech, the *Panegyricus*, 380 B.C., claims supremacy in Greece for Athens. Isocrates was very impracticable, his one political idea being to unite the Greeks under Athens for an attack on Persia; and he was a zealous opponent of Philip of Macedon. He is said to have died of grief upon Philip's decisive victory at Chæronea.

Isomerism. Amongst chemical compounds there are numerous cases of two or more substances all consisting of the same elements in equal amounts, and therefore represented by the same empirical formula, but which nevertheless differ in their chemical and physical properties. Such

compounds are termed *isomeric*, and the difference is regarded as due to the difference in the arrangement of the atoms to form the molecules of the compounds. In some cases the difference may be very great, as, *e.g.*, in the case of *methyl ether* $(\text{CH}_3)_2\text{O}$, a gas only condensible at about 23°C ., and *ethyl* (or ordinary) *alcohol* $\text{C}_2\text{H}_5\text{OH}$, a liquid boiling at 78°C . In this case the compounds belong to quite different *types*, *i.e.* the *ethers* and *alcohols*. When the bodies are of the same type of compound the differences become less marked, as in the case of the *paraffins* (q.v.), known as *normal* and *iso*, in the former of which the carbon atoms are considered to form a straight, in the latter a branched chain, *e.g.* $\text{CH}_3\cdot\text{CH}_2\cdot\text{CH}_2\cdot\text{CH}_3$, and $(\text{CH}_3)_2\cdot\text{CH}\cdot\text{CH}_3$, normal and iso butane. In benzene compounds also a new form of isomerism occurs, sometimes called *position isomerism*, which depends upon the orientation of the groups united to the nuclear group. Thus if we number the hydrogen atoms in benzene (q.v.) as in the formula



and replace two of the hydrogens by another element, it is seen that three different *isomers* could result, in which the displaced were 1·2, 1·3 or 1·4, these three types of compounds being respectively termed *ortho*, *meta*, and *para* compounds. Another form of isomerism is known in which the chemical properties of the compounds are almost entirely similar, but they show differences in their action upon polarised light. This is often called *physical isomerism*, and only occurs in compounds in which at least one carbon atom is united to four different elements, or groups of elements, *i.e.* is an *asymmetric* carbon atom. The explanation received in these cases is that although the constitution as expressed by ordinary formulæ is similar, yet the compounds are related to one another in their structure, in the same way as an object and its image.

Isometric Projection is a method of drawing objects of simple shape so that their dimensions may be shown in one drawing, instead of requiring separate views of plan and elevation. It somewhat resembles perspective; vertical lines are represented vertical, and horizontal parallel lines are shown parallel (in perspective they are made to converge to a point).

Isomorphism. It was found by Mitscherlich, in 1819, that certain substances of analogous composition possessed the property of crystallising in similar forms. To this phenomenon he gave the name of *isomorphism*, and the substances were termed *isomorphous*. Those he studied first were the phosphate and arsenate of soda, but further study proving that other compounds of phosphorus and arsenic also exhibited isomorphism, the term got transferred from the compound to the element, and those elements are termed isomorphous which can replace

one another in compounds without alteration, or at least with but slight alteration of the crystalline form. Further, similar compounds of such elements should possess the power of crystallising together, yielding mixed crystals, which are of a form intermediate between those of the components. Many series or groups of isomorphous elements can thus be obtained, as the phosphorus group, the calcium group, etc. Some substances can crystallise in two or more forms, are *di-* or *poly-morphous*, and cases are known in which we may get *isodimorphism* *i.e.* minerals, as the oxides of phosphorus and arsenic, in which the two crystalline forms of the one are similar to those of the other. Isomorphism was for a time extensively used for the determination of the atomic weights, as the quantities of two elements mutually replaceable are proportional to their atomic weights, but owing to exceptions to this statement, the numbers were not trustworthy. Isomorphism also formed the groundwork for a large number of hypotheses and speculations regarding the nature and form of the ultimate particles of matter, or atoms, but none of them can be regarded as having contributed aught to our knowledge upon these points.

Isomya, one of the orders of the *Lamelli-branchiata*. [DIMYARIA.]

Isopoda, an order of Crustacea (q.v.) belonging to the Malacostraca, and forming with the Amphipoda (q.v.) the group Arthrostraca (q.v.). The three main characters of the sides are that the body is somewhat compressed from above downwards, that there are branchiæ (or gills) on the limbs of the abdomen, and that the head is distinct from the segment bearing the first pair of limbs. The order has been divided according to the mode of life into the Natatorial, Sedentary, and Cursorial groups. The first has a broadened abdomen, which acts as a swimming tail: most of these are marine, and some are parasitic upon fish. The Cursorial group is the one which is best known generally, as it includes the common wood-lice (*Oniscus*), notable from their habit of rolling up into a ball when threatened with danger. Many of the parasitic Isopods illustrate the phenomenon of degeneration, for they have lost the use of their eyes and antennæ (feelers): some, such as *Cryptoniscus*, have also lost all trace of the abdominal limbs, and even of segmentation.

Isothermal Expansion of a gas signifies expansion without change of temperature. The volume and pressure change together, but the law connecting them during isothermal expansion is different to that which holds when the gas is allowed to expand without gain or loss of heat. For a gas remote from its vapour condition, isothermal expansion is such that the product of its volume and its pressure remains always constant.

Isothermal Lines are lines drawn through those points on the surface of the earth, or any portion thereof, that possess the same average temperature during any given interval of time.

Isotropism signifies the state of complete

identity of the properties of a body in all directions from any point in it. An isotropic body is essentially homogeneous, but homogeneous bodies also include those that are termed *æolotropic*. Such have complete identity of properties at two different points, in the same direction, but the properties are not identical in all directions from the same point. Water is isotropic, rock-crystal is *æolotropic*; both are homogeneous bodies.

Ispahân, or ISFAHÂN, the capital of the province of Iraak Adjemi in Persia, stands on the banks of the Zenderud. The city is surrounded by groves, orchards, and cultivated fields. The fine buildings and bridges are much decayed, but of late years some have been renewed. It was formerly the capital of Persia, and was the emporium of the Asiatic world. It is the religious centre of Persia, as the chief Imam or High Priest resides here. It is likely to rise to importance again, as the main road from Mohammera to the interior passes it.

Israels, JOSEF (b. 1824), genre painter, born at Gröningen, studied at Amsterdam and in Paris under Picot and Henri Scheffer. In 1885 his *Prince William of Orange opposing the Decree of the King of Spain* attracted attention in the Exposition Universelle. He settled at Katwijk near Leyden, and more recently at the Hague. In 1867 he received a third-class medal and the ribbon of the Legion of Honour, and eight years after the cross and first-class medal.

Issy, a French village half a mile from Paris, connected with Paris by a tramway. There is a fort, a castle, and manufactories of chemicals. Here Blücher defeated Davout, July 3rd, 1815. The fort suffered severely during the Franco-German War, 1870-71, and has since been rebuilt.

Istamboul, the Turkish name for Constantinople, the capital of the Ottoman Empire.

Istria, an Austrian margraviate, forming a peninsula in the N.E. corner of the Adriatic, between the Gulf of Trieste and Gulf of Fiume. Though mountainous, it is often swept by the sirocco and bora winds. It yields olive oil and wine. The capital is Rovigno.

Italy. The *geographical* position of Italy is clearly defined by nature. The Alps form her northern boundary, the Mediterranean Sea washes her western, southern, and eastern shores. At the beginning of the Christian era Italy was the seat and centre of the great Roman Empire (q.v.). Rome had been the capital of Italy centuries previous to that time, and continued to be so for centuries after it. Throughout the Middle Ages it was the residence of that ecclesiastical power which sought to rule the whole Christian world, and did rule its most important section. Nor did the dismemberment of Italy, after the fall of the Roman Empire, deprive Rome of its high position even when the Italian republics of Venice, Florence, Pisa, and Genoa were playing their great part in European history.

In our own time Rome has been recognised as

the capital of a united kingdom of Italy, the seat of her government, and the keystone in the arch of her recovered unity and independence. In the present also, as in the past, Rome continues to be the residence of the ecclesiastic who governs the largest amongst the Christian bodies who form the outward branches of the Universal Church. Thus from every point of view the Italian capital seems to justify her right to the proud title of the "Eternal City." With its foundation (commonly



MAP OF ITALY.

dated B.C. 753) commences the *history* of Italy. That history extends over more than 2,500 years, during which she played for long centuries the leading part, and has always held a prominent position alike in the ancient and modern world; while to-day she is still an important factor in the life of Europe—a power whose alliance and friendship is sought even by the strongest governments of our time. Her weight in the councils of the nations is felt and acknowledged on all hands.

This present position of Italy is, however, of very recent growth, and forms not the least interesting portion of her long and varied history. At the close of the last century Italy was, as she had been ever since the first break of the Roman Empire, divided into several states, and her history up to that time must be sought under that of Tuscany, Lombardy, Venice, etc. She contained in 1795 the republics of Genoa and Venice, the kingdoms of Piedmont and Naples, the Milanese territory, subject to the House of Austria, the States of the Church, governed by the Roman Pontiff, and the duchies of Tuscany, Parma, Modena, and Lucca. Then came the revolutions and conquests caused by the wars and policy of the French under the first

Napoleon. He completely overthrew all the temporal powers of the Italian peninsula, and substituted for them governments of his own creation. Under one form or another Napoleon ruled the whole country. This continued until his overthrow in 1814, when the Italian governments established by him fell with him. In 1815 the treaties of Vienna restored the previous order of things, with the exception of the republics of Genoa and Venice. The former was incorporated with the kingdom of Piedmont, and the latter was handed over to Austria, who united her Milanese possessions to those of the ancient Venetian republic, and so formed the Lombardo-Venetian kingdom, which was placed under the direct rule of the Austrian emperors.

But this settlement was made without consulting the Italians themselves. It may have been satisfactory to the powers who signed the treaties of Vienna, but it lacked the consent of the governed. These latter were simply called upon to obey the orders issued. Thus was wanting, as subsequent events quickly proved, one of the necessary elements of stability in the condition of the peninsula. It was treated, to use the well-known phrase, only as a "geographical expression." But those who dispose of a people after that fashion are likely enough to learn to their cost that they are only preparing for themselves troubles and difficulties leading to revolutions and war, with all their attendant evils, instead of that quiet and order which they fondly fancied were to be the fruits of their policy. Within two or three years of the settlement effected by the treaties of Vienna Italy was in a thoroughly disturbed and disaffected condition. This is proved by the unimpeachable testimony of no less a person than Prince Metternich himself, the Austrian Minister. In his own account of the condition of the peninsula, written in November, 1817, he speaks of "the general dissatisfaction of the Italian States." Nor did matters improve as time went on. In the year 1820 a revolution broke out in Naples which compelled King Ferdinand I. to promise a constitution, which he gave. Having taken his oath to it, he proceeded to the Congress of Laybach, there, as he averred, to defend the constitutional government established in his kingdom. But instead of doing so he returned to his dominions with an Austrian army, overthrew the constitution, and re-established his former despotic rule. In the following year a revolution broke out in Piedmont, where a constitution was demanded at the hands of its sovereign, Victor Emmanuel I. But this was opposed by Austria and her allies of the so-called Holy Alliance, Prussia and Russia, who declared they would not allow any constitutional liberties to be granted. Victor Emmanuel I. abdicated in favour of his brother, Charles Felix, who was a strong supporter of absolutist rule. With the aid of Austria he put down the constitutional party in Piedmont. But he dispensed with that aid as soon as possible, for, though determined to rule as an absolute sovereign, he had no intention of placing his country under the control of a foreign power. In 1830 and 1831 revolutions broke out in Modena, Parma, and the

Romagnol provinces, of which Bologna was the capital, and which formed the northern portion of the Papal States. Austrian armies put down these revolts, and silenced all demands for constitutional government. Austria occupied Bologna with her troops, and France Ancona, thus maintaining by force the temporal power of the Pope, which was of a purely autocratic type. Plots, conspiracies, and outbreaks were constantly occurring throughout the peninsula, the then governments of Italy meeting them with military rule, exceptional laws, and severe repression. The ferment of discontent driven below the surface only increased. The Carbonari and other secret sects were hard at work. Now began the indefatigable propagandism of Mazzini in favour of a united Italian republic. "God and the people" was his famous watchword. A man of remarkable character, of blameless private life, of indomitable energy, of absolute devotion to the idea of Italian liberty, he gathered multitudes of followers from all sections of Italian society. Men of the people like Garibaldi quickly joined him who were willing to risk all, including life itself, in attempts to overthrow the existing order of things by an appeal to arms. He had, too, plenty of followers among the wealthy and upper classes. Nor were there wanting men who declared even assassination allowable in the effort to rescue Italy from her intolerable bondage. As years went on this violent antagonism increased, and Italy became a veritable hot-bed of revolution. Such were the fruits of the policy adopted towards her by the statesmen who drew up the treaties of Vienna. This short-sighted policy, instead of producing as they had hoped order and contentment, resulted in discontent and revolution, culminating in violent repression, violent resistance, and even criminal outrage. At the same time that large class of moderate but determined reformers, of whom Balbo, Gioberti, Montanelli, D'Azeglio, Farini, Poerio, Settembrini, Durando, Ricasoli, Capponi were noble types, appealed aloud, but in vain, for such reasonable reforms as would at least ameliorate the condition of their unhappy country. Amongst the men of this class was one still unknown beyond the circle of his own friends, who was destined to take a foremost place not only among the liberators of Italy, but among the European statesmen of the 19th century—Camillo Cavour.

It was while this ferment of liberal and patriotic feeling was leavening the whole country that Pope Gregory XVI. died on the 1st June, 1846. On the 16th of that month Cardinal Mastai-Ferretti was elected in his place, and took the title of Pius IX. He was a man of kindly disposition and enlightened tendencies. He had been Bishop of Imola, and entered with no little warmth while there into the ideas of his friend and neighbour Count Pasolini, himself a member of the reforming party. The Count's memoirs, written by his son and translated by the Dowager Countess of Dalhousie, give an interesting account of the interchange of ideas between this Italian nobleman and the then Cardinal Bishop Mastai-Ferretti. The latter had read D'Azeglio's *Condition of the Romagna*, Gioberti's *Moral and Civil Supremacy of the Italians*, and

Balbo's *Hopes of Italy*. He felt a lively sympathy with the views of these Italian statesmen and patriots, and expressed wonder that the Court of Rome could be so often averse to such reasonable changes as were naturally demanded by the inevitable progress of civilisation and knowledge. Such was the pontiff who now mounted the Papal throne, and occupied it for a greater length of time than any of his predecessors—from June, 1846, to February, 1878. He inaugurated his reign by a general amnesty extended to all who had been condemned for political offences. In the following year (1847) a Council of State was instituted into which a lay element was introduced. These and similar measures were received with great satisfaction, and had a decided effect in strengthening the liberal tendencies of the courts of Turin and Florence. But throughout the peninsula there was stirred up another feeling, naturally arising from the liberties already given, the national desire to free Italy from foreign rule—in other words, the exclusion of Austria from the peninsula. The great mass of Italians were bent upon it, but the only sovereign who was willing actively to pursue such a policy was Charles Albert, King of Piedmont. An unlooked-for event precipitated this great question into the arena of practical politics. It was the French Revolution of February, 1848, followed by that in Vienna some six weeks later. Then Milan and Venice rose in arms against the Austrians. After five days' fighting the capital of Lombardy became free, Marshal Radetzky leaving the city and falling back on Verona. Venice, too, won her independence, and placed one of her most illustrious sons, Daniele Manin, at the head of her restored republic. The Dukes of Parma and Modena had to leave their states. After a momentary hesitation Charles Albert threw himself into the national movement, and issued a proclamation on the 23rd of March, 1848, in which he promised to come to the aid of the Lombards and the Venetians. He accordingly crossed the Ticino, and so began the war with Austria. The Grand Duke of Tuscany joined his forces to those of Piedmont, and Ferdinand of Naples was compelled to do the same, but took the earliest opportunity of recalling them. He violated the constitution he had given, and betrayed alike the liberties of his subjects and the national cause. The enthusiasm throughout Italy knew no bounds, but the Papal Government was in great difficulty as to what course to take. At first the Papal army was called out, but only to defend the Papal territory. This, however, by no means satisfied the feeling of the country. Loud was the demand that the Roman forces should unite in actively assisting the war in Lombardy and Venetia against Austria. The Pope hesitated, but at length on the 29th of April, 1848, he held a consistory in which he pronounced an Allocution declaring he would not join in the war against Austria. It was a terrible blow to the national cause, but it was a yet heavier one to the Papal temporal power, for thereby it was placed in direct antagonism to Italy's national wishes. From that hour Italy lost all confidence in the Pope as a temporal ruler. He, indeed, would willingly have

persuaded Austria to give up her Italian possessions, but her rulers would not at that time entertain such an idea even for a moment. The war went on, ending in the complete triumph of Austria, the defeat and abdication of Charles Albert, King of Piedmont, the restoration of Austrian rule in Lombardy and Venetia, accompanied by absolutist governments, in Parma, Modena, Tuscany, the Papal States, and Naples, duly supported by the power of Austria, except in Rome, where French troops upheld the temporal sovereignty of the Pope. From that time to its fall foreign support became absolutely necessary to its existence.

There was, however, one, but only one, among the Italian states where despotism did not triumph. It was the kingdom of Piedmont. Charles Albert had been succeeded by his son, Victor Emmanuel II., in whose favour he had abdicated on the battlefield of Novara, where Marshal Radetzky won a signal victory on the 23rd of March, 1849. The new king commenced his reign amidst the greatest difficulties, but nothing could induce him to swerve from the constitution granted to the Piedmontese by his father. To that he took his oath, and that oath he kept with a faithfulness which soon won for him the title of "*Il re galantuomo*." He was greatly aided by the loyal support of the Piedmontese, who were both devoted to the House of Savoy and resolved to uphold the constitutional freedom given by their late sovereign and confirmed by his son. The latter had also at his command one of the noblest bands of constitutional advisers who ever served any sovereign or any country. Soon the ablest among them, Count Cavour, assumed the conduct of affairs. He quickly proved himself to be one of the greatest statesmen in Europe. From 1849 to 1859 this little kingdom of Piedmont maintained with splendid courage and success, despite great difficulties, complete civil and religious freedom, while constantly vindicating, both by her example and by her diplomatic action, the principle that Italians had the right to national independence and capacity to use and maintain it if only left to do so without foreign interference. The internal order and liberty of Piedmont were an incalculable help to the cause of Italian freedom. It gave also to Italy a chief around whom all could rally with absolute confidence. Victor Emmanuel inspired no less trust in the hearts of statesmen like Cavour than he did in the hearts of leaders like Manin, the ruler of Venice, and Garibaldi, the popular idol of his country, both of them men of the purest patriotism, both republicans in theory, and both implicitly trusting, and justly trusting, the king. That trust was complete, universal, and deserved. He proved himself worthy of it in every action of his political life, from the day of his accession on Novara's field to the hour of his death in Rome as King of Italy.

The war of 1859, when Napoleon III., Emperor of the French, joined his armies to those of Victor Emmanuel, resulted in giving Lombardy to Piedmont, but it also enabled the other peoples of Italy to show whom they desired to rule over them, because the French Emperor, then at the height of his power, declared that, whatever might be his

wishes, or those of other sovereigns, the Italians should be free to make their own choice. Parma, Modena, and Tuscany speedily voted their annexation to Piedmont. The people of the Papal States did the same, except in Rome and its immediate territory, where the French Emperor maintained the last remnants of the Papal temporal power. In the meantime a revolution had broken out in Sicily against the rule of the Neapolitan Bourbons. Garibaldi, ever ready to fight for his country's freedom, went there, despite all opposition and advice, and speedily overthrew the Bourbon Government in Sicily and Naples alike. The Italian troops under Victor Emmanuel himself advanced quickly to Naples, close to which the king and popular chief met, and so the whole of Italy and Sicily became a united kingdom under Victor Emmanuel. Venetia and Rome with its small territory alone remained under foreign rule. The newly-formed kingdom of Italy joined Prussia in 1866 in her war against Austria, and though the Italians were defeated at Custozza, her good faith as an ally, and her services in having obliged Austria to maintain 100,000 men in Venetia, were rewarded by the addition of that province to the kingdom of Italy. Yet it may with truth be said that Austria herself gained greatly by the events of 1859 and 1866, for by them she got rid of her absolutist system in Church and State, broke away from the Concordat of 1855 with the Vatican, and, as the Austro-Hungarian monarchy, was endowed with constitutional freedom. Having become reconciled with Germany and Italy, she has secured by alliance with them an assured position against foreign aggression, and has now in Italy a friendly neighbour instead of a bitter foe. Justice and freedom have knit the two nations together by ties of friendship. Injustice and despotism bred between them hatred and strife.

In 1870, with the fall of the second French Empire, fell the temporal Papal power which that empire upheld. Then Rome became the capital of Italy and the seat of her government. In January, 1878, King Victor Emmanuel died, and was buried in the "Eternal City" as the sovereign of United Italy acknowledged by all the powers of the world. He was at once succeeded by his son, King Humbert I., whose accession took place not only without difficulty but as easily as if the House of Savoy had reigned over the country, with Rome as its capital, not for eight or eighteen years but for eighteen generations, so strong and so unanimous was the devotion of the whole nation to that royal house which had done so much for Italy's unity and freedom. But it has not been without great efforts and sacrifices that Italy has attained to her present position. To get rid of the system imposed upon her by the treaties of 1815, and, having freed herself from it, to establish a system of free government in the place of five or six despotic rulers, was a task of no slight difficulty. It was greatly lessened by having ready to hand in Piedmont institutions which could, with certain modifications, be applied to the whole peninsula.

Constitution.—Italy is now ruled by a constitu-

tional sovereign, with a Senate or Upper House whose members are nominated for life by the king on the advice of his responsible ministers, and a Lower House of 508 members chosen by an electorate numbering about 2,500,000. An elector must be an Italian citizen twenty-one years old, able to read and write, and paying in direct taxation not less than 10 francs 80 centimes.

The *population* of the whole country, including the islands of Sicily, Sardinia, and Elba, has now reached just 30,000,000. In 1865 the same civil, commercial, and administrative legislation was extended to the whole country. The commercial code was further reformed and improved in 1883. The judicial and administrative systems were reformed in 1888–90, but it was not until 1890 that the new penal code, after long and mature studies, came into force. One formidable difficulty against which the new order of things had to contend was the gross ignorance of the population, more especially in central and southern Italy. It was found in 1863 that something like 77 per cent. of the population could neither read nor write, and in the old Papal and Neapolitan States the percentage rose to 85 and even 90. Such was the legacy of crass ignorance left by the governments now happily overthrown. It was no easy task to change this state of things, but much has been effected towards it, though not a little still remains to be done. By 1892 a government primary school had been established in every commune, and 2,400,000 children were under instruction. The annual expenditure on education has reached £2,500,000 sterling, while the average of those who were unable both to read and write had been reduced to 52 per cent., showing, however, what need there is for still further exertions. Both higher and technical instruction have also made great advances. Teachers are more numerous and better paid, while a fund for their sustenance in old age has been formed since 1878.

Brigandage had been rife for generations in Italy, and had become almost a recognised institution, with which the old governments not unfrequently made terms. It has now been reduced to very narrow limits, though still showing itself from time to time. Like the "Camorra" and the "Mafia," secret societies for the extortion of blackmail, these criminal legacies of an evil past die slowly, but surely, as civilisation and enlightenment take the place of lawlessness and crime, those natural fruits of that ignorance and tyranny which were among the chief supports of the old order of things.

Italy has had, and still has, to bear heavy financial burdens. In 1863 she had a deficit of 400,000,000 francs or £16,000,000 sterling. Not until 1875 did she reach an equilibrium as between her income and expenditure. Her public funds had been as low as 50—they at length rose to nearly par. Up to 1885 she maintained her equilibrium. Since then, chiefly owing to those increased armaments which are the incubus and terror of every European exchequer, the expenditure has exceeded the income of the country. Efforts are being made once again to restore that

equilibrium, not without hope of success, and her funds maintain a price varying from 92 to 94 on the foreign Stock Exchanges of Europe. Her resources increase, though slowly, owing to her heavy taxation. The People's Banks, "Banche Popolari," of which Signor Luzzatti was the moving spirit, and the "Casse Rurali," or Rural Banks, formed to meet the needs of the small rural cultivators by Dr. Wollemborg, have been sources of great help to the poorer classes in town and country. Thereby not only have these latter been able to borrow at a low instead of a usurious interest, but they have laid by considerable sums in consequence. Moreover, these banks are inducing habits of thrift and self-reliance, which are of themselves a great benefit. These admirable institutions have without exception stood their ground during periods of panic and depression, and are extending more and more their beneficent operations. Italy possesses, and no doubt needs in the present circumstances of Europe, a formidable and well-equipped army and navy, which make her a useful ally and a power with whom all others must reckon. But her progress is unquestionably hampered by the heavy expenditure those forces entail upon her people.

The principal agricultural *produce* of Italy consists of wheat, Indian corn, oats, barley, rice, hemp, flax, wine, olive-oil, and silk cocoons. Large dairy farms exist in various provinces of Italy. In general the land is much sub-divided. *Factories* are on the increase, among which there are many silk factories. In 1882 the weight of the cocoon harvest was 70,000,000 lbs.; in 1891 it had reached about 85,500,000 lbs.

The forestry department is under the Ministry of Agriculture, with a council of forestry, and is now carefully attended to; the yield is from 90 to 100 millions of lire or francs annually. The mineral wealth of the country consists chiefly of iron, zinc, and lead ores, sulphur, salt, graphite, and boric acid. The value of the mineral products in 1878 was 55 million lire or francs, and in 1890, 63,800,000 lire or francs.

The quarries of Italy, especially those of marble, are very valuable, the annual output being estimated at one million sterling. The heavy taxation and the restrictions of her tariff impede the growth of Italy's commerce. During the years 1888-1891 inclusive, the total value of her imports and exports has diminished under an increased tariff and heavy taxation.

Literature. The history of literature in Italy is in some respects peculiar. The fact that we use two different names for the language, and consequently for the literature of the same country and the same people according to the age which we are considering, is of itself sufficient to mark the case as unique. Alfred the Great and Alfred Tennyson, with a thousand years between them, alike called their language "English;" Homer and Tricoupis, with more than two thousand, both wrote Greek. But though less than eight hundred years separate Boethius and Dante, we call the *Consolations of Philosophy* Latin, and the *Divine Comedy* Italian. This division of the language used by men of the same land and the same race serves to simplify

considerably the task of the historian of Italian literature. Until the year 1200 or thereabouts, the language which we now call Italian, and which represents rather the colloquial than the, hitherto, written speech of Italy, cannot be said to have had a literature. Doubtless there must have been popular ballads, satirical and amatory; but no one thought to write them down. In the north of Italy the language was slowly differentiated from Provençal: and it is in Sicily that the first outburst of real poetry seems to have taken place. Ciullo of Alcamo, near Palermo (ca. 1200), and the Emperor Frederick II. (1194-1250), who was perhaps more at home in Sicily than anywhere else, have left charming love poems. Before the end of the 13th century the spirit of poetry was abroad throughout Italy. In Rossetti's *Dante and his Circle* will be found the names of over forty writers belonging to this period, some of whom have left lyrical poems of a high degree of merit. Among them are the names of Guido Guinicelli of Bologna. Guittone of Arezzo, who, if not the inventor of the sonnet, is thought to have given it its final shape, Jacopo of Lentino, another Sicilian, and Dante's friends, Guido Cavalcanti and Cino of Pistoia. Of prose literature we find as yet but little. The greatest work of the age, Brunetto Latini's *Trésor*, a kind of encyclopædia of all learning, was written by him in French, because "it was most common to all people": and a history of Venice is said to exist, written in the same language. Before the end of the century, however, DANTE ALIGHIERI (q.v.) had written his *New Life*, and early in the following century his *Banquet*, in the latter case with arguments in favour of the use of the "vulgar tongue." In his *Comedy*, in the form in which we have it, written probably between 1310 and his death in 1331, Italian literature reached at one bound its highest level. The 14th century, or, as the Italians call it, the "Trecento," gave birth to other works, which though far inferior to this supreme achievement of genius, are hardly less superior to anything which the language has since produced.

FRANCIS PETRARCH (q.v.) (1304-1374), better known in his own day as a scholar and writer of elegant Latin, has earned immortality by a sequence of sonnets and odes, which form a tiny fraction of the mass of his published writings. JOHN BOCCACCIO (q.v.) (1313-1375) may be regarded as the father of Italian prose. His collection of stories, known as the *Decameron*, though occasionally dealing with subjects which decent writers now leave alone, contains many very beautiful tales told in admirable language. His other imaginative works are less interesting, though equally models of style; but his commentary on Dante, of which not more than one-sixth was written, is of great value. Franco Sacchetti (1335-ca. 1400) was another teller of short stories; and Fazio degli Uberti, somewhat senior, wrote a long and ponderous geographical treatise, called *Dittamondo*, the chief merit of which is that it shows him to have been a diligent student of Dante.

More nearly contemporary with Dante was John Villani (ca. 1275-1348), whose *Florentine History*, it is hardly too much to say, is the most fascinating

work of the kind since Herodotus. His task was continued by his younger brother Matthew and his nephew Philip. The revived study of the ancient languages, especially of Latin, which reached its highest development towards the end of the 15th century, did grievous harm to vernacular literature in Italy. All the serious literary efforts seem to have been devoted to the discovery and imitation of the ancient masterpieces; the age became thoroughly sceptical, and its literature reflects its mood. The strongest Italian work of the "Quattrocento" is burlesque, whether, as in the case of Pulci's *Morgante Maggiore*, avowed, or as in that of Boiardo's *Orlando Innamorato*, and Ariosto's *Orlando Furioso*, half concealed under more stately diction. Towards the end of the century a greater name, the greatest we may say after Dante, appears in NICOLAS MACCHIAVELLI (q.v.) (1469-1527). In his chief works, the *History of Florence*, the *Discourse on the first Decade of Livy*, the *Prince*, he gives the first example in modern times of the critical study of history and politics. His somewhat junior contemporary, Francis Guicciardini (1482-1540), wrote a *History of Italy*, which, though it became a by-word for tediousness, is an important contribution to our knowledge of the times. Meanwhile the "novella" or short story continued to flourish; and most men of letters tried their hands at it. The most famous names of the period are Cintio Giraldis and Matteo Bandello. Both these have the honour of having supplied themes to Shakespeare. The last Italian poet, it may be said, who has survived to the present day is Torquato Tasso (1544-1595). He has been termed "the poet of that new and undefined emotion which we call sentiment," and *Gerusalemme Liberata* is read to this day, at all events by students of the language. The seventeenth century produced, except for some of Redi's poems and Tassoni's coarsely humorous burlesque *La Secchia Rapita*, little in the way of poetry save bad taste. The *Pastor Fido* of Guarini (1537-1612), though not devoid of elegance, is full of conceits and affectations; while the *Adone* of Marino (1569-1625) set the fashion which has earned for the Italian *Scicentisti* the reputation of the worst school of poetry that the world has ever seen. Towards the close of the century, however, patriotic feeling inspired somewhat better work in Filicaia (1642-1707). History still held its place; and Father Paul Sarpi's (1552-1623) *History of the Council of Trent*, first published, by the way, in England, ranks among the greatest works of its class. During the 18th century the literary activity of Italy found its outlet chiefly in the drama. The plays of Carlo Goldoni (1707-1793) and Vittorio Alfieri (1749-1803) still hold the stage; the latter, indeed, being the most vigorous writer whom Italy had produced for many generations. Pietro Trapassi, who called himself Metastasio (1698-1782), wrote a great number of dramas, adapted to musical setting, and containing many graceful lyrics; and Carlo Gozzi (1720-1806) maintained the old Italian style of farcical comedy against the "comedy of character," introduced by Goldoni. In the present century science and criticism, rather than pure literature, have claimed the best intellects of Italy, and much of her energy has

been occupied in the task of making herself a nation. The most famous name is Alessandro Manzoni (1785-1873), poet, dramatist, and novelist. In the latter capacity he came strongly under the inspiration of Scott, which indeed produced a school of novelists, among whom Tommaso Grossi may also be noted.

In poetry the chief names of the century are probably Giacomo Leopardi (1798-1837), Giuseppe Giusti (1809-1850), and Giosuè Carducci (b. 1835), now Professor at Bologna. The most recent Italian school of poetry appears to cultivate a vehemence of expression rather out of proportion to its intrinsic poetical merit. Good work has been done in history by Michele Amari (b. 1806) and Pasquale Villari (b. 1827). Giuseppe Mazzini (1808-1872), though best known as an active politician, left a considerable mass of writings, chiefly on political and social subjects; and Count Angelo de Gubernatis (b. 1840) has touched literature at almost all points. In fiction Italy has chiefly to depend upon translations from French and English, but some good original work has been done by Matilde Serao, Giovanni Verga, and Edmondo de Amicis.

Ethnology. At the dawn of history Italy had already been long divided into four distinct ethnical zones: 1. The basin of the Po and surrounding valleys occupied by a heterogeneous population of Ligurians, Teutons, Slavs (Venedi, Wends), and Celts, these last being dominant, whence the expression, *Gallia Cisalpina*, applied to the whole region. 2. Etruria and some neighbouring districts, home of the Etruscans. 3. Umbria, Sabinum, Latium, Campania, Samnium, domain of the Italic peoples proper. 4. Apulia, Lucania, Brutium, that is, all the southern provinces, with Sicily, inhabited by a substratum of Iapygians, Messapians, Sicani (Siculi), and other aborigines, everywhere dominated by intruding Greek settlers, whence the expression *Magna Græcia* applied to South Italy. Some of these peoples, such as the Ligurians, Etruscans, and Sicani, were of uncertain origin; but the great majority were certainly Aryans, mainly of the Celtic, Italic, and Hellenic branches. Nearly all the later intruders—Longobards and other Teutons towards the close of the Western Empire, Normans in the 11th and 12th centuries, Albanians and Neo-Greeks after the fall of Constantinople—were also Aryans, so that the immense majority of the present inhabitants must be regarded as of Aryan origin, as all have for about 2,000 years been almost exclusively of Aryan (Italic) speech. Hence a certain uniformity of type, by which the Italian, with much local diversity, may be readily distinguished from the inhabitants of the Iberian peninsula, and other south Europeans more largely affected by non-Aryan elements. But the dualism pervading the whole of the Aryan world [ARYAN RACES] exists also in Italy, where grey or blue eyes, fair or chestnut hair, florid complexion, and tall stature prevail in the north, while black eyes and hair, somewhat sallow complexion, and medium or low stature are dominant in the central and southern provinces. Dr. Beddoe, however, distinguishes five sub-types: 1. The Venetian,

essentially Slav"; 2. The Piedmontese, Celtic; 3. The classical Roman, still prevalent in Latium; 4 and 5. North and South Neapolitan. (Dr. J. Beddoe, *On the Physical Character of the Natives of some parts of Italy*, in *Transactions of the Ethnological Society*, 1861.)

Languages, Italic, a main division of the Aryan linguistic family, comprising the extinct Umbrian, Volscian, Sabine, and Oscan, of which but scanty remains have survived, and the Latin of Latium, which, with the spread of the Roman Empire, became for centuries the dominant language of west Europe and north Africa. After the fall of the Western Empire, Latin still remained the vernacular everywhere except in Britain and Africa, gradually passing through various degraded forms into the Neo-Latin or Romance languages of the modern "Latin world." These are chiefly: 1. *Italian*, with numerous marked dialects, of which the *Tuscan* has become the literary standard; 2. *Langue d'Oc* of south France; 3. *Langue d'Oïl* of north France (standard French); 4. The *Spanish* group of dialects, of which *Castilian* has become the standard; 5. *Portuguese*; 6. *Rumanian* of Moldavia, Wallachia, and the Pindus Mountains, Balkan Peninsula; 7. *Rhaeto Romance* (Ladin) of parts of Switzerland and Tyrol; 8. *Walloon* of east Belgium. All these are derived independently, not from the classic Latin of literature, but from the *lingua rustica* or *sermo campestris*—that is, the Roman rude colloquial forms current in the several provinces, afterwards cultivated and enriched by borrowings from the classic tongue. The tendency has everywhere been to substitute particles and auxiliaries for the Latin grammatical endings, and this tendency has resulted in the total disappearance of the old declension, of the neuter gender, and of a large part of the old conjugation, with fresh synthetic formations in one or two instances. Thus the future *amabo* first became colloquially *amare habeo*, and then *amare ho*, *amerò* (Italian), *amaré* (Spanish), *aimerai* (French), and so on. The remarkable uniformity with which this process has been carried out over a vast linguistic area, ranging from the Danube delta to the Atlantic seaboard, is explained by the great antiquity of the analytical forms (*amare habeo*, *scriptum habeo*, etc.), which were already features of the *lingua rustica* in Italy at a date previous to the founding of the military and other colonies in Gaul, Spain, and other distant provinces of the empire. Hence these forms everywhere entered into the structure of the Neo-Latin languages, all being the direct issue of colloquial Latin.

In the Aryan system the Italic group appears to occupy a position somewhat intermediate between the Celtic and the Hellenic, though the separation took place at such a remote epoch that the relations of the several branches to the parent stem and to each other are now obscured. In some respects, and especially in its phonetic system and declension, Italic is more archaic than Hellenic. Thus Latin retains the ablative and traces of the locative case, both long lost in Greek. It also preserves the organic initial *s* before vowels, which in Greek becomes an aspirate, as in *ἕξ* = *sex* = six; *ἅλς* = *sal* = salt. But on the other hand the Latin conjugation

has been largely recast, while rhotacism (change of *s* to *r*) has made large inroads, already noticed in the old Umbrian, Oscan, and early Latin. Thus: *genus, generis* for *genusis*; *amantur* for *amant-se*, etc. But Latin preserves the *k*, *qu*, which becomes *p* in Greek and later Celtic, as in *quinque* = Irish *coic* = Welsh *pump* = Greek *πέντε* = five. The Latin phonetic system is mainly preserved in the Romance tongues, with a change of gutturals to palatals in some instances (French, *chien* from *canis*; Italian, *cinque* from *quinque*), and in Spanish more extensive modifications, due, perhaps, to Arab influences (comp. *hijo* with *filius*). In the New World Spanish ranks in importance next to English, being the language of culture for all the mixed populations of the Hispano-American republics, as Portuguese is for those of Brazil. French is mainly confined to lower Canada, parts of Louisiana, Algeria, and the islands of Mauritius and Réunion in the Indian Ocean. All the other Romance tongues are restricted to their respective European domains, though Rumanian has followed the migratory movement of the Wallachians into Hungary. Altogether the Italic languages are spoken by about 170,000,000 of human beings.

Itch or SCABIES. A skin disease produced by a parasite which, if allowed to develop in the epidermis of the skin, burrows extensively, producing an eruption which is accompanied by intense irritation. The itch mite, or *acarus scabiei*, somewhat resembles a cheese mite; it can only just be detected with the naked eye, but is readily visible on using a lens. The parts affected with special frequency are the wrists, palms, and interspaces between the fingers. The eruption produced consists of papules or vesicles, sometimes pustules. Treatment consists in the daily use of hot baths with plenty of soap, and the rubbing in of sulphur ointment with a view to destroying the parasite.

Ithaca, now THIAKI, is the smallest of the Ionian Islands except Paxos. It lies twenty miles west of the mainland of Greece. Its area is 37 square miles. Wine, currants, and olive oil are grown. Sponges and coral are fished for. The chief town is Vatny. It is famous as the country of Homer's Ulysses.

Ivan [JOHN], the name of four Czars of Russia, of whom IVAN IV. (1530–84), known as IVAN THE TERRIBLE, is the most famous. He reigned from 1533, did much for arts and commerce, and extended his dominions by arms. He concluded a treaty with Queen Elizabeth in 1553. He conquered Kazan and Astrakhan and annexed Siberia. He showed no mercy to the *boyars* and cruelly oppressed some of the towns of his kingdom, such as Moscow, Jven, and Novgorod (where 60,000 people were slain in six weeks). He slew his son in a mad fit in 1581.

Ivanovo, a town in Russia, in the Government of Vladimir, has been the centre of the Russian cotton industry since the middle of the 18th century.

Iviza, one of the Balearic Isles, 56 miles from the Spanish mainland. Area, 228 square miles. Chief town, Iviza. The products are salt and fruit.

Ivory. [ELEPHANT.]

Ivory black is a pure variety of animal charcoal, which is obtained by calcining ivory shavings in iron retorts, much in the same manner as bone black is derived from bones. Ivory black is extensively used as a pigment, and for production of Indian and Chinese ink.

Ivory, Vegetable. [COROZO-NUT.]

Ivry, a village in the department of Eure in France, 16 miles N.N.W. of Dreux. The famous battle between Henry of Navarre and the armies of the League was fought on the plain of Ivry (March 14th, 1590). The population is 1,100.

Ivy, a genus of evergreen climbing shrubs with scattered simple exstipulate leaves, a simply umbellate inflorescence of symmetrically pentamerous flowers, and a globular five-chambered baccate fruit. They have an epigynous disk and a slightly ruminated albumen. The genus, known botanically as *Hedera*, is the type of the order Hederaceæ, and the numerous recorded species, native to the Old World, may be reduced to three. *H. helix*, the common ivy of Europe, is a variable plant. It climbs on rocks, trees, or walls by means of numerous adventitious rootlets or claspers (French *crampons*), and its stems, which have a thick cork, may reach 10 inches in diameter. The leaves on the climbing part of the plant are three- to five-lobed, and it is not until it reaches the top of a tree or wall that the plant bears any flowers. Before doing so it branches horizontally and bears ovate unlobed leaves. The flowers are greenish, and on their stalks and calices have stellate hairs. The berries are black or rarely yellow. The plant is in no sense a parasite, but has an injurious mechanically constrictive action on tree-stems. On sound walls it promotes dryness or warmth; but if its shoots penetrate between stones or bricks its growth will overthrow the building.

Ixion, in Greek mythology, father of Pirithous, king of the Lapithæ. Zeus took Ixion to heaven to purify him after his treacherous murder of his father-in-law, Deioneus. He attempted to seduce Hera, but was tricked by a phantom made by Zeus to resemble her, and begat the original Centaur. Hermes bound him hand and foot to a wheel, which revolved for ever in the sky.

J.

J, the tenth letter of the English alphabet. At one time it was used indiscriminately with *i*, and in Latin *i* was used both for *i* and *j*, and had both the vowel sound of *i* and the consonant sound of *j*. Now *j* has only the *dzh* sound.

Jabalpur, (1) the name of the northern division of the Central Provinces, Hindostan, and also of a district in the division. (2) The town of Jabalpur is an important railway and commercial centre. The manufacture of cotton is the chief industry.

Jabiru, any species of *Mycteria*, distinguished from the Storks by having the bill with a slight



JABIRU.

upward curve. There are four species from Africa, India, Australia, and the Neotropical region. They are often called Giant Storks. [STORK.]

Jablochkoff's Candle, now practically obsolete, was an electric arc-lamp composed of two parallel rods of carbon placed side by side, separated by a thin layer of kaolin or Chinese clay. A rapidly alternating current was sent up one rod, and passed across the top down the other rod. An arc light was thus produced, and the two rods were consumed at the same rate by reason of the alternations. The heat developed was sufficient to burn away the clay at the arc.

Jaborandi, a plant occurring in Southern America, which is used in medicinal preparations, and is the source of three different alkaloids—*jaborine*, *pilocarpine*, and *pilocarpidine*, all of which exhibit marked physiological activity, and to which the medicinal properties of the plant extracts are due. The drug, and its active principle, *pilocarpine*, have been extensively used of late years in medicine, mainly with a view to acting upon the skin, producing sweating in disease of the heart and kidneys.

Jacamar, any bird of the South American family Galbulidæ, resembling in form the bee-eaters of the Old World. They are arboreal and insectivorous, with slender body, long slender bill, wedge-shaped tail, and the toes in pairs. In one genus, *Jacamaralcyon*, there is a single toe behind. The plumage is usually metallic green.

Jacana, any bird of the sub-family Parrinæ, of the Rail family. They are plover-like birds, from the warmer parts of both hemispheres, with very long toes and claws that enable them to walk with ease on floating vegetation. There is a horny wing

spur and generally a frontal lobe with wattles at the base of the bill.

Jacaré. [ALLIGATOR.]

Jachmann, EDUARD KARL EMANUEL, German seaman, was born at Danzig in 1822, and became a captain in 1859. In 1862 he commanded the *Thetis* in an expedition to Eastern Asia, and in 1864 commanded the Prussian squadron at the battle of Jasmund. For this he was promoted to be rear-admiral. From 1864 to 1867 he was port-admiral at Kiel, in 1868 he was made vice-admiral, in 1871 he became commander-in-chief of the German navy, and in 1873 he retired. He died in 1887.

Jack, the colours displayed from a staff erected on a ship's bowsprit, or on her bows; especially the Union Jack. [FLAG.]

Jack, HYDRAULIC, a small portable hydraulic press arranged with a force-pump working by hand, and used for the purpose of lifting heavy bodies. A *screw-jack* has the same object, but works on the principle of the screw. A strong screw with square threads is held in a vertical frame and turned by means of a hand lever. It thus rises, and may be made to lift up heavy weights under which it has been inserted. Its multiplying power is increased by lengthening the lever, and by diminishing the pitch of the screw, but usually its efficiency is much less than that of the hydraulic-jack by reason of the great loss of energy in overcoming friction.

Jackal, a name, adopted from the Persian, for several species of wild dogs, intermediate between wolves and foxes, from Southern Asia and Africa. They are nocturnal, and hunt in packs, giving voice in fearful howls. They are useful scavengers, clearing away carrion and garbage—a diet which



JACKAL (*Canis aureus*).

is the cause of their offensive odour; but they commit great depredations among poultry and other domestic animals. Sickly sheep and goats often fall victims to jackals, and a wounded antelope is pretty sure to be tracked down by a pack. Hares are their favourite quarry in Ceylon, but they have been known to hunt and pull down a deer. Their cunning is as proverbial in the East as that of the fox is in the West, and the "fox" of Scripture is probably in many cases the jackal. Dr. Jerdon says that the idea that the jackal is the lion's provider may have arisen from the notion that the yell of the pack gives notice to the lion

that prey is afoot, or from jackals having been seen to feed on the remnants of the prey killed by the lion. The Common Jackal (*Canis aureus*), from Asia and the north of Africa, is dusky-yellow in colour, but subject to a great deal of variation. It is about three feet long (the tail counting for a foot), and the height at the shoulder eighteen inches. The Black-backed Jackal (*C. mesomelas*), ranging from Nubia to the Cape, and the Senegal Jackal (*C. anthus*), from Central Africa, are somewhat larger.

Jackdaw (*Corvus monedula*), an Old World species of the type-genus of the Crow family. It is a little more than a foot in length, with black plumage, glossed on the wings with purple, and dark grey neck. It is a native of Britain, and feeds on insects, worms, and molluscs. Jackdaws nest socially in holes in cliffs, in trees, ruins, church towers, and sometimes in chimneys. They have considerable power of mimicry, and are often kept as pets.

Jackson, the name of numerous towns and geographical districts in the United States, the chief of which are:—(1) A large county in the N.E. of Alabama, from the fertile soil of which cotton, wheat, Indian corn, and various kinds of grass are raised. (2) A city in Michigan, capital of a county of the same name. It is the terminus of several railways, and contains the State prison. (3) The capital of the State of Mississippi, 183 miles N. of New Orleans. It contains the State library and a State institution for the deaf and dumb. Large quantities of cotton are shipped from it every year. (4) The capital of Madison county, Tennessee, 90 miles E.N.E. of Memphis. It is the seat of a Baptist university, and exports cotton.

Jackson, ANDREW (1767–1845), seventh President of the United States. He was early left an orphan, and suffered much in his youth. He was taken prisoner in the War of Independence, after the conclusion of which he entered upon his twofold career of lawyer and soldier. He was a member of the convention which framed the Tennessee constitution, became a United States senator in 1797, and a judge of the Tennessee Supreme Court in the following year. He commanded the State militia in the war of 1812, and on December 23, 1814, when he had become a general in the United States army, repulsed with great loss the attack of Sir E. Pakenham on New Orleans. In the previous year he had successfully closed the war with the Creek Indians. In 1824 he was a candidate for the Presidency of the United States, and four years later was elected. In 1832 he was re-elected. He was largely influenced by personal friends who held no office and were named "the Kitchen Cabinet," and acted somewhat arbitrarily in vetoing the Bill for the renewal of the charter of the United States Bank in 1832, and in causing its deposits to be withdrawn and placed in the State banks. On the other hand, by his firm conduct towards the advocates of "nullification" (the doctrine that a State has the power to annul a Federal law) he postponed for several years the struggle between them which afterwards broke out on the slavery question.

Jackson, THOMAS JEFFERSON (1824-63), was born in West Virginia. He entered the army in 1846, and distinguished himself in the Mexican War. In 1851 he became a professor in the Military Academy of Virginia, and soon after resigned his commission in the army. Ten years later, when his native State seceded, Jackson was appointed colonel in the Confederate army, and commanded a brigade under Johnston at the first battle of Bull Run. Here he acquired the *sobriquet* of "Stonewall Jackson" by the firmness of his troops under the Federal fire. He was immediately after given a command, and gained the victories of Winchester and Port Republic. He afterwards co-operated with Lee, and drove one Federal army northward. In 1862 he was made lieutenant-general. After rendering good service in the defence of Fredericksburg, he brought to a culminating point his military career by a brilliant manœuvre and charge in the battle of Chancellorsville (1863). A few days later he died from the results of wounds received from his own army, some of whom had fired upon him by mistake at night.

Jacksonville, the name of several towns in the United States, of which the chief are:—(1) A town in the N.E. of Florida, situated at the mouth of St. John's River. It has a large export and coasting trade. It is also a great health-resort. (2) A town in Illinois, 30 miles W.S.W. of Springfield. Here are several State institutions (for the blind, the insane, etc.), a free library, and twenty-two churches; also Illinois College and a Conservatory of Music. It stands in the midst of an undulating prairie.

Jacobi, FRIEDRICH HEINRICH (1743-1819), a German philosopher and man of letters, was born at Düsseldorf. His youth was devoted to business, and his middle life to the service of the State. In 1805 he became president of the Munich Academy. A zealous adherent of Spinoza, and an acquaintance of Lessing and Goethe, he had controversies with Moses Mendelssohn and Schelling. His chief works were *On the Things of God and their Revelation*, *David Hume on Belief*, and *Waldemar*, a philosophic novel.

Jacobi, KARL GUSTAV (1804-51), an able mathematician of Jewish parentage, was a native of Potsdam. He graduated at Berlin, and held professorships at Königsberg from 1827 to 1842. He was author of *Fundamenta Nova Theoriæ Functionum Ellipticarum* (1829), and published many important contributions to mathematical science in *Crelle's Journal*. He was one of the founders of the theory of determinants. He died a royal pensioner at Berlin.

Jacobins, THE, took their name from the "Convent of the Jacobins," a Dominican monastery where they held their sittings. The Dominicans were called Jacobins, because their earliest house in Paris had been dedicated to St. James. The nucleus of the Jacobin Club was the "Club Bréton," a body of Breton deputies to the States-General who used to meet at Versailles to concert action in the Assembly. Out of this grew "the Friends of

the Constitution," a larger body, who, when they moved to Paris with the King and Assembly in October, 1789, met at the "Couvent des Jacobins." Their proceedings soon became public, their debates were reported, and citizens who were not deputies became members. The Moderate Revolutionists, such as Lafayette, now began to secede, and the society was directed by the members of the Left and Left-Centre in the Constituent Assembly. During the year 1790 more than one thousand similar clubs were formed throughout France, and were affiliated with the "mother-society," with whom also an elaborate system of correspondence was organised. After the death of Mirabeau (March, 1791) the influence of Robespierre began to be predominant, and the name Jacobin came to have a wider significance. After the flight from Varennes the society was reorganised on a more democratic basis, but the club as a body took no part in the Revolution of the tenth of August (1792). Robespierre and most of the leaders also opposed the conflict with Europe, which was the policy of the Gironde. The Jacobins defended Marat from the attacks of the latter party, and assisted the Commune to destroy them. They supported Robespierre in his proscription of the Dantonists and Hébertists, and they shared in his fall. More than one hundred perished with him on the scaffold, and the club, temporarily closed, was not allowed to be reopened until the society had undergone a thorough purgation. In November, 1794, the chief leaders of the Thermidorian reaction obtained a decree for the suspension of their sittings, and when this was resisted Legendre treated the Jacobins as Cromwell had the Rump. In 1799 a new society, which had been formed under the same name, was dissolved by order of the Directory.

Jacobites, the general name given to adherents of the Stewart dynasty after the Revolution of 1688. Etymologically the word means "followers of James" (Jacobus). Their history may be divided into three periods, viz.:—(1) From the Revolution to the death of James I.; (2) from the accession of Anne to 1715; (3) from 1715 to 1745. During the reign of William III., until the Peace of Ryswick, they had the support of France. Their attack on Ireland was, however, foiled at Derry and the Boyne, and a French invasion of England was averted by the victory of La Hogue. After this they were never very strong in England. There were several plots to assassinate William III., and leading men of all parties corresponded with the Court of St. Germain's to secure their position in case of a counter-revolution; but the bigotry of James kept dissensions alive, and prevented those who had supported the Revolution in the interests of Protestantism from giving more than a theoretical adhesion to the Jacobite cause. James Edward's recognition by France on the death of his father in 1701 aroused the national jealousy felt by England for that country. In Scotland, however, Jacobitism obtained support from clan-feeling, and the unpopularity of the war with France which grew up after its early years, combined with the good-will

of Anne towards her family, made it extremely probable that on her death the Stewarts would be restored. She died, however, before the plans of the Tories were fully matured. The nation as a whole were neutral; but the mercantile classes were interested in the preservation of the Act of Settlement, and the securities given for the safety of the Protestant religion were not deemed adequate. The Whigs, moreover, through the appointment of Shrewsbury as Treasurer, secured the army and the ports. The Regent Orleans had different views from Louis XIV., and in the Fifteen the Jacobites had no French support. The revolt of the Highlanders was led by the unstable Mar, who was soon separated from his English allies, and re-embarked with the old Pretender. The English Jacobites surrendered at Preston, and their leaders were executed. Wyndham and five other Tory-Jacobites, who had seats in Parliament, had been previously secured in the Tower. The Jacobites were now distinctly divided into a parliamentary opposition, which allied itself with the malcontent Whigs and a mere band of intriguers. Bolingbroke, who had been James Edward's Secretary of State at St. Germain for a short time after the Fifteen, came back from France in 1723, and was the soul of the constitutional section. Walpole's policy towards them was a mixture of conciliation and firmness. On his fall and the end of the long alliance with France under Fleury, the warlike party were again in the ascendant. A French invasion of Scotland was prevented by a storm in 1744, but on July 25 of the next year Charles Edward, the young Pretender, landed at Moidart. He was supported by the clans and helped by the incompetence of Sir John Cope, the English general, whom he defeated at Prestonpans. He then out-manœuvred Wade and marched into England, where, however, he obtained little support. The Highlanders were divided by clan jealousies, and after reaching Derby the invading army marched back to Scotland. Another success was gained at Falkirk, but was soon followed by the disaster of Culloden, after which Jacobitism and the independence of the Highland chiefs, which had been its chief support since 1715, came to an end simultaneously. On the accession of George III. a new Royalist party was formed, in which Jacobitism became merged. As a romantic sentiment it still remained till the days of Scott's childhood. [NON-JURORS, PRETENDER, ETC.]

Jacob's Ladder, or GREEK VALERIAN, *Polemonium æruleum*, giving its name to the order Polemoniaceæ, is a herbaceous perennial, native to the North of England, and commonly grown in gardens, sometimes with variegated leaves. It grows about a foot high, with hardly branched stems, scattered pinnate leaves, and numerous shortly-stalked blue or white pentamerous flowers, nearly an inch across.

Jacotot, JOSEPH (1770-1840). French educationalist, was born at Dijon, at whose university he was professor of Latin at nineteen. He was a zealous Revolutionist, and served in Belgium in 1792. He afterwards returned to his native town, where he became professor of "method of

sciences," mathematics, and Roman law successively. In 1815 he was elected to the French Assembly, but afterwards went to live at Brussels, and was given an appointment in Louvain University. He returned to France after the Second Revolution. His system, which was adopted in Belgium, is set forth chiefly in his *Enseignement Universel, Langue Maternelle* (1823).

Jactitation of Marriage, the boasting or giving out by a party that he or she is married to some other, whereby a common reputation of their matrimony may follow. The person may be compelled to prove the actual marriage.

Jade, or NEPHRITE, two names signifying "kidney-stone," applied to a very tough variety of hornblende (q.v.) from its supposed value in renal disease. This silicate of lime and magnesia is crypto-crystalline or compact, and has a hardness of 6.5; but its toughness is its most noticeable character. It varies in colour from white (allied to tremolite), with a specific gravity of 2.9, to dark green (allied to actinolite), with a specific gravity of 3.0. It occurs in boulders near Batongol, to the west of Lake Baikal, and very rarely in Europe; but in the Kuen-lun Mountains it forms veins in schists and gneisses. It also occurs in New Zealand, New Caledonia, and other Pacific islands, where it has long been used by the natives for axes, clubs, and ornaments. Jadeite (q.v.), chloromelanite, saussurite, fibrolite, amazon-stone, and bowenite have been confused with jade, but most of these substances are heavier than true jade.

Jadeite, a silicate of aluminium and sodium, related to epidote, but resembling jade, from which it differs in greater hardness and weight, its specific gravity being 3.28 to 3.35. It occurs in Yunnan and Burmah, and implements, etc., made of it are found in Egypt, Switzerland, Mexico, and Costa Rica.

Jadejas (JAREJAS), a people of North-West India, forming with the Kattis the bulk of the population in the Kattiawar Peninsula and Katch. They are generally tall and shapely, and evidently of mixed type, showing traces both of Aryan and Semitic blood. Characteristic is the black silky beard, which acquires an enormous development, perhaps greater than in any other people. At present they regard themselves as Rajputs, though the claim is rejected by the very lowest castes of that haughty race. Morally they take a low position even in India, being great boasters, very contentious, given to drink, and of more than doubtful morals. Till recently female infanticide was practised, as amongst the Rajputs.

Jaen, the capital of a province of the same name in the north-east of Andalusia, Spain, is 37 miles north of Granada. A 16th-century cathedral stands on the site of an old mosque, and contains a relic called the Holy Face. There are also many churches and religious houses. In 1712 there was a terrible earthquake at Jaen.

Jaffa, or JOPPA (properly Yáfá), a port of Palestine about 30 miles N.W. of Jerusalem, with

which it is now connected by railway. It is mentioned in an inscription of Sennacherib, and was the harbour of Judæa after the exile. It was fortified by Simon Maccabæus, and destroyed by Vespasian as a nest of pirates. Captured by Saladin in 1187, it was retaken by Richard in 1191, but a few years later again taken by Malek el Adil. In 1799 it was stormed by Napoleon. The modern town is the seat of a lieutenant-governor, and has several foreign consulates. A trade in fruit and wheat is carried on. There are many fruit-gardens, orchards, and wells of sweet water in the neighbourhood.

Jagatai. [CHAGATAI.]

Jagellons, an illustrious dynasty which reigned in Lithuania, Poland, Bohemia, and Hungary, descended from Jagello, who succeeded to the grand-duchy of Lithuania in 1381, and, on the death of his father-in-law Lewis the Great, became king of Poland after being converted to Christianity under the name Ladislaus II. Six of his family reigned in succession, the last, Sigismund Augustus, dying in 1572, but his line was continued through a sister of the last king until 1668. The younger branch reigned in Hungary and Bohemia till Lewis II. was killed (1526) by the Turks.

Jaggas (CHAGAS), a Bantu people of the south-east slopes of Mount Kilimanjaro, East Africa. Their territory lies on the main route between the coast and the equatorial lake regions. They are of a mild disposition, industrious agriculturists, and friendly to Europeans, to whom they now look for protection against the incursions of the predatory Masai tribes. In the recent partition of East Africa between England and Germany the Jagga county was assigned to the latter power, the dividing line running a little north of Kilimanjaro.

Jaguar (*Felis onça*), the American "tiger," ranging over the Western continent from Texas to parts of Patagonia, frequenting the wooded banks of the great rivers and the reedy shores of lakes. It is rather larger than the leopard (q.v.), and the tawny fur is marked pretty regularly with ring-like spots enclosing a disc darker than the ground colour, and often marked with small dark dots. Jaguars seem to have little fear of man, and though they will seldom attack him when they can get other food, Wallace records a case where one entered the hut of an Indian and sprang upon him in his hammock. Horses and mules are their favourite food, but they also eat fish and turtles, scooping out the flesh of the latter from the unbroken shell with their paws. The story of their contests with alligators, though generally discredited, is recorded by Wallace on what he seems to consider good evidence. But a great deal would depend on the size of the alligator.

Jahn, OTTO (1813-69), a German philologist and archæologist, was born at Kiel, and educated there and at Leipzig and Berlin. He left Kiel for Greifswald, to which he went as professor of archæology in 1842, held a chair at Leipzig from 1847 to 1851, and from 1855 till his death was professor at Bonn. Besides important archæological and philological

writings, he was author of a life of Mozart and editor of some of Goethe's letters.

Jail fever. A term which is now happily out of date. In bygone days, when little or no attention was directed to the sanitary conditions of prisons, and when gross overcrowding was allowed to exist in them, it was no uncommon thing for large numbers of prisoners to die of a malady to which this name was given. The disease was probably, in most instances, typhus fever.

Jains (JAINAS), the great trading class of West India, whose guilds date back to Buddhist times before the Mohammedan invasions. But they have long ceased to be true Buddhists, though preserving many traditions and even ceremonies of that religion. The later Jains suffered much persecution from the Brahmins for introducing foreign goods and artisans into the country. They admit caste, which is rejected by all Buddhists, but still use Pali as their sacred language. The Jains are very enterprising, and form numerous wealthy communities, especially in Rajputana and throughout the Bombay presidency.

Jaisalmir, or JESSULMEER, a native state under British protection, forming the north-western corner of Rajputana, Hindostan, has an area of 16,447 square miles. It forms part of the Great Desert, and there is only one small river. Sandhills cover the face of the country far and wide. Camels and sheep are kept by the inhabitants.

Jakuns, collective name of numerous aboriginal tribes of the Malay peninsula, who present a great variety of types, showing all the transitions between the indigenous Negritoes and the intruding Malays. Including the Sakai, Besisk, and others, there are three distinct groups, those of Johore in the extreme south, of Malacca on the west coast, and of Rumbau and Saney-Ujong further inland. Some are scarcely to be distinguished from the true Negritoes, being noted for their small stature (4 ft. 10 in.), deep brown complexion, frizzly hair and pronounced prognathism. They mostly speak rude Malay dialects, wear no clothing, dwell in frail huts of branches and foliage, and live exclusively by the chase. (Boriè, *On the Wild Tribes of the Interior of the Malay Peninsula*; E. T. Henry, *Sur les Races Sauvages de la Péninsule Malaise, et en particulier sur les Jakuns*, in *Bull. de la Soc. d'Anthrop.* IX. p. 717.)

Jalap, a purgative drug consisting of the large root-tubercles of *Exogonium purga*, a convolvulaceous plant, native to woods on the eastern slopes of the Mexican Andes, near Jalapa, whence it derives its name. It has twining aërial stems, cordate-acuminate leaves, and salver-shaped purplish-pink flowers. From its slender rhizomes proceed the turnip-shaped tubercles, sometimes as large as an orange, which are brown externally with small transverse scars, and whitish internally. Jalap owes its properties to one or more resinous substances present to the extent of from 12 to 18 per cent., and worm-eaten tubercles are more valuable from the removal by the insects of the starchy and

woody parts. Besides Mexican or Vera-Cruz jalap, as it is called from the port of shipment, the drug is now cultivated in Jamaica and Ootacamund; and *Ipomœa simulans* and *I. orizabensis*, species of a closely-allied genus, yield Tampico, and Orizaba, woody, or male, jalap. It is largely used for its purgative properties. It is administered in the form of the resin, extract, tincture, and compound jalap powder. The dose of the last-named preparation is from 20 to 60 grains for an adult.

Jalapa (XALAPA), a town in Mexico, some 70 miles north of Vera Cruz, is situated 4,500 feet above the sea in very fertile country. It has a 16th-century Franciscan monastery, and was formerly of some commercial importance. The drug jalap grows wild here.

Jalisco (XALISCO), or GUADALAJARA, a fertile but unhealthy state on the Pacific coast of Mexico, having an area of nearly 40,000 square miles. Through it runs the river Santiago, and on the southern border is Lake Chapala. The capital is Guadalajara.

Jamaica (Xaymaca, "Land of springs"), the chief of the British West Indian islands, is about 100 miles to the south of Cuba and about the same distance west of Hayti. It is about 144 miles long from west to east, and 50 broad. The Cayman Islands, as well as Caicos Island and Turk's Island, are included in the governmental area. Discovered by Columbus in 1494, it was in a few years occupied by the Spaniards. By a treaty made in 1670 it was ceded to England, having been held by her since 1655, when Penn and Venables conquered it. The aboriginal Indians were then nearly extinct. Cromwell shipped thither many prisoners, especially those taken in Ireland. African negroes had been imported by the Spaniards to work the plantations, and the English imported many more till the emancipation of the slaves in 1834. Insurrections of the slaves, who were very badly treated, broke out in 1760, 1765, and 1795, although three years before the last movement an Act had been passed for ameliorating their condition. The British Legislature did its best, but the planters were not to be controlled, and in 1831 another movement had to be put down. In 1838, after a parliamentary inquiry, an Act abolishing apprenticeship was passed by the Imperial Parliament. In 1865 the last insurrection of the slaves was crushed with great severity by Governor Eyre (q.v.). The constitution granted in 1664 was then annulled, and Jamaica has since been a Crown colony, under a Governor, a Legislative Council, and a Privy Council. The Blue Mountains, which vary in height from 5,000 to 7,500 feet, traverse the eastern part of the island. Jamaica has a fine stretch of coast-line, and more than thirty fine harbours, of which the finest is Kingston Harbour, or Port Royal. There is great variety of climate; the coast is less healthy than the interior. Partial rains fall in the spring; the heavy rains begin in June and last two months, during which intense heat prevails. A third rainy season is in October and November. Many kinds of water-fowl are found, as well as parrots and

pigeons, and a wide variety of insects, but few snakes. Land-crabs and tortoises abound, more especially the violet crab (*Cancer ruricola*). The chief fruits are the mango, the banana, the pineapple, cocoanut, melon, mulberry, and bread-fruit. Maize flourishes greatly, and guinea-grass, which is very useful for grazing purposes, grows to a height of nearly 6 feet. Large crops are also raised of ginger, cochineal, pepper, vanilla, arrow-root, and several medicinal herbs. The chief articles grown for export are sugar, various fruits, coffee, pimento, logwood, and ginger, more than half the trade being with the United States. Many negroes have small holdings, and are the chief fruit-growers. Rising industries are horse-breeding and the curing of fish, which abound in the rivers. It is thought by experts that the chief wealth of Jamaica lies in its minerals; and gold, silver, and the chief other metals are known to exist in considerable quantities, but are little drawn upon. What were known as "Jamaica diamonds" turned out to be crystals. Jamaica is divided into three divisions or counties, of which the largest is Middlesex, the central portion; the others are Surrey, on the east, and Cornwall, on the west. The capital is Kingston (q.v.), and the chief other town is Spanish Town (St. Jago de la Vega), a little further west.

James, St., son of Zebedee and brother of St. John, was put to death under Herod Agrippa, in the year 44. His festival is on July 25. He is the patron-saint of Spain.

James, St., son of Alphæus, another of the Twelve Apostles. His festival, together with that of St. Philip, is kept by Catholics and Anglo-Catholics on May 1.

James, St., called "the Great" or "the Just," also "the Lord's brother," was the probable author of the Epistle of St. James. He seems to have held the position of Bishop of Jerusalem (see several passages in the Acts). Josephus says he was stoned to death by order of Amanus, the high-priest, in the year 62; but Eusebius took from Hegesippus another tradition as to his death. By the Greek Church his festival is kept on October 23. The separate identity of James the son of Alphæus and James the Lord's brother is not clearly established, and the authorship of the Epistle has sometimes been ascribed to James the brother of John.

James I., king of England (James VI. of Scotland), was born in 1566, the son of Darnley and Mary Queen of Scots. He was carefully educated by George Buchanan and other tutors, but his youth was passed in troublous times. From the year 1578, when the Regency was taken from Morton, he was nominally king of Scotland. His mother was still alive, but was a prisoner in England. In 1585 he consented to receive a pension from Elizabeth, and though he made a formal protest against the execution of Mary, his resentment did not prevent his co-operating with England against Spain. The chief events of James's reign in Scotland were the abolition of Episcopacy in 1581, and the subsequent seizure of the king, who

had opposed it, by the conspirators who carried out what was called the Raid of Ruthven; the rescue of the king next year by Gowrie, Mar, and Glencairn; the revolt of the king against his rescuers, and his defeat of them in 1584; the compulsory pardon of the remnant of these at Stirling (1585) and dismissal of the obnoxious Arran; the rebellions of Bothwell (nephew of Mary Stuart's husband) in 1592, 1593, and 1594; the final defeat of Huntly and Errol, the Catholic malcontents, at Glenlivet in the latter year; and the Gowrie Conspiracy (q.v.). James had been for some time in secret correspondence with Robert Cecil, who prepared the way for his general acceptance as King of England on the death of Elizabeth in 1603. Here he was able to carry out his Arminian views with more freedom than had been possible in Scotland. But while the Puritans were dealt with firmly at the Hampton Court Conference, the Romanists were also offended by the expulsion of the Jesuits, and the result was the Gunpowder Plot. Disputes with Parliament on the subject of money grants were frequent; and after the death of Cecil, Earl of Salisbury, power fell into the hands of favourites, first of Carr (Earl of Somerset) and then of George Villiers, Duke of Buckingham (q.v.). Under the latter illegal or vexatious ways of obtaining money were resorted to, and no Parliament sat between 1614 and 1621. That of 1621 impeached Bacon and refused to support James's foreign policy, and was therefore dissolved after a very short session. The king had married his daughter Elizabeth to the Elector Palatine, but refused to give the Protestant kinglet anything but moral support, till in 1624 the chagrin of Buckingham at the failure of the Spanish match led at last to a declaration of war against Spain. Parliament was reassembled for this purpose, and a French match for Prince Charles was being negotiated when the king died on March 27, 1625. James I. was a very diligent writer. The *Basilicon Dōron*, and treatises against witches and tobacco, were his best-known productions.

James II. (1633–1701) was the second son of Charles I. by Henrietta Maria of France. After being captured at Oxford during the Civil War, he escaped to France, and served in the French and Spanish armies. He was created Lord High Admiral at the Restoration, and showed some ability as a naval commander in the Dutch wars. As an avowed Romanist, he was, however, compelled to resign his office on the passing of the Test Act (1673). An attempt was also made to exclude him by Act of Parliament from the throne; but though this failed, he was sent into honourable exile, first on the Continent and then to Scotland, where he acted as Lord High Commissioner. In 1684 he was illegally restored to the office of Lord High Admiral and to his seat in the Council. On the death of Charles II. in 1685 he succeeded peaceably to the throne, when he soon openly proselytised, dismissed his Parliament, called Romanists to his councils, and revived the Court of High Commission in order to punish the clergy for preaching against his attacks on Protestantism. He also

forced Romanists on some of the colleges at Oxford and Cambridge, obtained a decision from the judges in favour of the right of the Crown to dispense with laws, employed Romanist officers in an army he had assembled on Hounslow Heath, and finally in April, 1687, published the Declaration of Indulgence. The Nonconformists, however, refused to take the bait, and the seven bishops were supported by all sections of the nation when they refused to read it in the churches. They were then tried for libel, but triumphantly acquitted. William of Orange, who had long been in correspondence with the Whig leaders, was now invited by the leading men of all parties to protect English liberties against his father-in-law; and James Edward, the old Pretender, who was born at this time, was regarded as a supposititious child. William landed on Nov. 5, 1688; and James, when too late, rescinded his most arbitrary measures. Deserted by his army, he attempted to escape abroad, and was arrested at Faversham; but it was found convenient to allow him afterwards to effect his purpose. He was welcomed in France by Louis XIV., and with his help made an expedition to Ireland in the following year, but was defeated at the Boyne (1690). The remainder of his life was passed at St. Germain, under the protection of the French king, whose pensioner he had been even when actually ruler of England. James II. was twice married. Mary and Anne were his daughters by Anne Hyde, daughter of Lord Clarendon; the Old Pretender was the son of Mary of Modena. By his mistress Arabella Churchill, sister of Marlborough, he was father of the accomplished James, Duke of Berwick.

James I., king of Scotland (1391–1437), was the second son of Robert III., on whose death in 1406 he became king. He was, however, a prisoner in England from 1405 till 1424. The kingdom was governed till 1419 by his uncle Robert, first Duke of Albany, to whose machinations the capture of James was probably due; and afterwards, till the return of the king, by Albany's son, the second duke. The latter was put to death for misuse of his power by James, who reconstituted the Scots Parliament, reformed the statute law, and took measures to curb the Highlands and generally to maintain the authority of the law. The result was a conspiracy, headed by Sir James Graham, and the king was murdered in the Black Friars Abbey at Perth. James was both an able ruler and a cultivated man. His poems, *The King's Quhair* and *Christie's Kirk on the Green*, were the best produced in Great Britain in the 15th century.

James II. (1430–1460), son of James I., did not begin to rule for some years, the kingdom being in a state of feudal anarchy. In 1452 he stabbed William, Earl of Douglas, and two years later declared the estates of his house forfeited. In 1460 he crossed the border to help Henry VI. against the Yorkists, but soon returned, and was killed at the siege of Roxburgh Castle by the bursting of a cannon.

James III. (1453–1488), son of James II., was in the guardianship of the Bishop of St. Andrew's.

till in 1466 he was carried off by the Boyds. When the king obtained some amount of power, he wished to lead an army to the help of Louis XI. of France, but was prevented by the Estates. He afterwards plunged into such excesses that a conspiracy of the nobles broke out on the eve of an expedition into England, and some of James's favourites were hanged at Lauder. The rest of the reign was occupied in schemes of vengeance against his enemies. The Estates took part against the king, who was defeated at Sauchieburn, near Stirling, and stabbed at Beaton's Mill, in the neighbourhood of Bannockburn, whither he had fled.

James IV. (1472-1513) came to the throne on the death of his father, James III. His relations with England were very hostile during his early years. In 1502, however, a temporary alliance was formed between the two countries by the marriage of James IV. to Margaret Tudor. The depredations of English pirates and the traditional influence of France, however, brought about the old state of things in a few years, and the result was the expedition which ended in the disaster of Flodden Field (q.v.), where the king of Scotland fell.

James V. (1512-1542) was but a year old when he became titular king of Scotland after Flodden. French influence was at first in the ascendant, and Albany, the regent, was able to fill the towns of Scotland with French garrisons. The queen-mother and her second husband, Angus, headed the English party, and in 1524 Albany was deprived of the regency. Quarrels between Angus, Argyle, and other great nobles followed, and in 1528 James escaped from their control and drove his step-father into England. Peace with England was made in 1534; but James made two French marriages—the first with Magdalen, daughter of Louis XII., the second with Mary of Guise, who became the mother of Mary Stuart, Queen of Scots. James V. was known as "the King of the Commons," whom he conciliated by his lavish generosity, and still more by his firmness towards the nobles. This, and the confiscation of estates seized by the latter during the minority, alienated them to such an extent that when the last of the Scottish kings led an expedition against England they deserted him. Solway Moss was less a battle than a rout, and the king died of chagrin shortly afterwards.

James, GEORGE PAYNE RAINSFORD (1801-60), a historical novelist, was the son of a London physician. After much travelling and discursive reading, he published *Richelieu* in 1829, and for nearly twenty years continued to produce similar works, the sum-total of which is said to have reached a hundred. *Darnley*, *Philip Augustus*, and *Henry Masterton* were some of the best. They were very popular and profitable to the author. James was made historiographer by William IV., and published *A Life of the Black Prince* and other historical works. He was British consul in Massachusetts and Virginia for several years, and subsequently at Venice, where he died.

James, SIR HENRY (1803-77), military surveyor, was a native of St. Agnes, Cornwall. In 1820 he

was gazetted a subaltern in the Royal Engineers, and was next year appointed to the Ordnance Survey. In 1842 he became local superintendent of the geological survey of Ireland, and, after being employed in various other duties, was in 1854 made director-general of the Ordnance Survey. From 1857 to 1870 he was director of the Topographical Department of the War Office, was knighted in 1860, and attained the rank of major-general in 1868.

James, SIR HENRY, was born in 1828 at Hereford. He was called to the Bar in 1852, took silk in 1869, and entered Parliament as a Liberal in the same year. In 1873 he was named Solicitor-General, and was afterwards Attorney-General until the resignation of Mr. Gladstone. From 1880 till 1885 he again held the latter office, and was chiefly responsible for the passing of the Corrupt Practices Act (1883). He was offered the Lord Chancellorship in Mr. Gladstone's first Home-Rule Ministry, but declined. Up to 1885 he sat for Taunton, but since that date has represented Bury (Lancashire) as a Liberal Unionist.

James, HENRY, the well-known novelist, was born in New York in 1843, but has lived chiefly in England and Italy. He was educated at Harvard, Geneva, and Paris. His first novel, *Roderick Hudson*, appeared in 1875, and was followed by *Daisy Miller* (1878), *The Portrait of a Lady* (1881), *The Bostonians* (1886), *The Tragic Muse* (1890), and many others. As a critic, Henry James has published *French Poets and Novelists* (1878), *Hawthorne* ("English Men of Letters"), and *Partial Portraits* (1888).

James, JOHN ANGELL (1785-1859), a popular Independent minister, was born in Dorsetshire. He made a reputation as a preacher at Birmingham, where he officiated at Carr's Lane Chapel. He took an active part in municipal affairs, was chairman of Spring Hill College, and one of the founders of the Evangelical Alliance. He was also the author of numerous devotional works, after reading one of which, *Christian Charity*, Wordsworth sought his acquaintance.

James, WILLIAM, naval historian, who died in 1827, published in 1817 *Naval Occurrences with the Americans*, and in 1822 *The Naval History of Great Britain from the Declaration of War by France to the Accession of George IV.* (1793-1820). The work is the best authority for the period which it covers, but is tinged with an anti-American bias.

Jameson, ANNA BROWNELL (1794-1860), a prolific writer on art and various other subjects, was the daughter of a Dublin miniature painter named Murphy. After having been for several years a governess, she was married in 1825; but she was not happy with her husband, who left her in England when, four years later, he went to Dominica to take up a legal appointment. Mrs. Jameson's first work was published in 1826, but her *Characteristics of Women* (1832), a series of essays on Shakespeare's female characters, was her first book of any great merit. During a visit to the Continent in the following year she became intimate with

Ottile von Goethe, and met Tieck and Schlegel. Her best-known works are *Poetry of Sacred and Legendary Art* and *History of our Lord and of John the Baptist, as represented in Art*, which was finished by Lady Eastlake.

Jameson, ROBERT (1774-1854), mineralogist, was born at Leith. He soon abandoned medicine for science. He studied for two years under Werner at Freiburg, and in 1804 was appointed regius professor of natural history at Edinburgh, being also keeper of the university museum. He was afterwards converted to the views of Hutton on geology. He took part with Brewster in founding the *Edinburgh Philosophical Journal*.

Jamesone, GEORGE (d. 1644), a Scotch portrait painter, a native of Aberdeen, was born about 1588. He is said to have studied under Rubens at Antwerp. He returned to Scotland about 1620, and painted portraits of James VI., Charles I., Montrose, and others of his chief contemporaries.

James River, a river of Virginia, U.S.A., 450 miles in length, is formed by the junction of two streams near the eastern border of West Virginia, and flows in an easterly direction, bending at first to the south, then making a northerly curve, and finally turning south till it reaches the Atlantic by a large estuary about twenty miles below Richmond. It is navigable by large steamers for about sixty miles.

James's powder. The pulvis antimonialis of the pharmacopœia is the modern substitute for this preparation, which was formerly largely used in fevers. The remedy is a depressing one, and its indiscriminate employment cannot be recommended.

Jamesonite, a mineral consisting of the sulphides of lead and antimony ($Pb_2Sb_2S_5$), which occurs as crystals of the rhombic system in Cornwall, Hungary, Siberia, and Brazil. It frequently contains small quantities of iron, has a specific gravity of 5.7, and varies in colour from steel grey to almost black.

Jamieson, JOHN (1759-1838), author of *Etymological Dictionary of the Scottish Language*, was born at Glasgow, at whose university he entered at the age of nine. He was sixteen years a minister at Forfar, but was invited to Edinburgh in 1797, two years before he had replied to Priestley's *History of Early Opinion*. While here he contributed to the union of the burgher and anti-burgher sects in 1820.

Jamshidi, a large tribe in the province of Herat, Afghanistan, numerous especially in the district watered by the Khûshk and its affluents. Though often grouped with the Zeidnat Hazaras, as of Mongol descent, the Jamshidis appear to be of Persian stock, as shown by their almost pure Iranian type of physiognomy. All are Mohammedans of Persian speech, and live a much more settled life than the Hazaras.

Janin, JULES GABRIEL (1804-74), a French critic and novelist, was the son of poor parents,

living at St. Étienne. He made his reputation as dramatic critic of the *Journal des Débats*, his contributions to which were collected under the title, *Histoire de la Littérature Dramatique*. He also wrote numerous novels, translated Horace and *Clarissa Harlow*, and edited, with Sainte Beuve and Houssaye, fragments from *Manon Lescaut*. Twelve volumes of his *Œuvres Choisies* appeared in 1875-78. Janin succeeded to the chair of Sainte Beuve in the Académie in 1870.

Janina [JOANNINA], the largest town in a district of the same name forming the central portion of Albania, stands picturesquely on the western shore of a lake about fifty miles north-east of Corfu. At the beginning of the century it was a large town, the residence of Ali Pasha; but the fortress is now in ruins. The town has been Turkish for nearly five centuries, but the bulk of the population are Greeks. The place has long been famous for its manufacture of gold lace.

Janissaries, Janizaries, the Anglicised form (through Italian or French) of the Turkish *Yenicheri* (from *yeni* = "new" and *askar* = "army") or infantry of the Sultan's guard, organised and named towards the end of the fourteenth century, under Amurath I. They were originally the Sultan's fifth of the Christian captives taken from the Albanians, Servians, Bosnians, Roumanians, Bulgarians, and other nations, the finest youths only being enrolled. They were converted to the Mohammedan religion, and subjected to the strictest discipline. The force was increased and supplemented by fresh contingents of captives, and by recruits from the children of Christians living under Mohammedan rule, who were compulsorily enlisted every five years, and carefully educated as Mohammedans. Their careful selection, their excellent education, and their rigid monastic discipline made them invincible soldiers, and on their exploits at Varna, Cassova, and numerous other battles, was based the power of the Ottoman arms. After the death of Soliman II. this formidable force frequently coerced or even deposed the Sultan. After their resistance to repeated efforts to reform their organisation, and render it less dangerous to the State, had brought about several revolutions, they rebelled in 1826; but were completely defeated, and finally abolished under Mamhoud II.

Jansen, CORNELIUS (1585-1638), a celebrated Dutch theologian, was born near Gorcum in Holland of humble parentage. He studied at the University of Louvain, first at the Jesuit's college, and afterwards at the college of Adrian IV., where he fell under the influence of Jacobus Jansonius, from whom he imbibed the Augustinian doctrine of grace. In 1604 he went to Paris, and afterwards spent several years with Vergerius at Bayonne. In 1617 he was summoned to Louvain to take the headship of the new college of St. Pulcheria. In 1619 he took the degree of doctor in theology, and in 1630 became professor of Biblical exegesis. All this time he was actively using his influence against

the Jesuits, and as the result of two visits he made to Spain in 1624 and 1626, certain encroachments made by them on the privileges of Louvain University were restrained. In 1636 he was made bishop of Yprès, as a reward for a work published by him under a pseudonym against the alliance of France with the Protestant Gustavus Adolphus.

For the last twenty-two years of his life he was at work upon his great treatise "Augustinus, seu doctrina S. Augustini de humane naturae Sanitate, aegritudine, et medicina, adversus Pelagianos et Massilienses," which was published, posthumously, in 1640 in three folio volumes. The importance of the work lay in the epilogue, in which the doctrines of the Jesuits were compared to the errors of the Massilians.

In France the matter later became an important political question. After a struggle, the bill called "Unigenitus" (1713) was registered as a law by the Parliament of Paris. After this the Jansenists in France declined into a set of mystical fanatics. [PARIS, FRANÇOIS DE.]

Janssen, VAN CEULEN (sometimes called JONSON or JOHNSON), a Dutch portrait painter who lived some time in England, was born probably in London in 1593, but may have been a native of Amsterdam. He painted portraits in this country till the Civil War, when he went to Holland, and died about 1664.

Janssens, ABRAHAM (1567-1632), historical painter, was born at Antwerp, where in 1607 he was dean of the master painters. Good examples of his art, which resemble that of Rubens, are to be seen in the Antwerp Museums and at Vienna. He called himself Janssens van Nuyssen.

Janssens, VICTOR HONORIUS (1664-1739), another historical painter, was born at Brussels. In 1718 he was made painter to the emperor at Vienna. The churches and palaces of the Netherlands contain many examples of his art.

Januarius, ST. (SAN GENNARO), the patron saint of Naples, was Bishop of Benevento at the end of the 3rd century. According to the Roman Breviary he suffered martyrdom under Diocletian at Pozzuoli in 305. His body was then taken to Naples, where some of his blood was preserved in a phial. It is supposed to liquefy on his anniversary (September 19), and two other days in the year, when it is carried in procession to be adored by the people. On the occurrence of any public calamity resort is also had to the miracle, which is even thought to counteract the eruptions of Vesuvius.

Janus, an Italian divinity, the god of opening and beginning (Lat. *Janua* = gate). He took precedence even of Jupiter, and is supposed by some authorities to have been of Etruscan origin. The hill called Janiculum, on the N. of the Tiber, was probably the original seat of his worship. He is represented on coins with two faces looking in opposite directions. He carries keys and is crowned with laurel. The gates of his temple at Rome were open in time of war, and shut in time of peace. There was originally an archway on the site, from which the troops marched out to war.

January, or the first month of the agricultural year, took its name from the God Janus.

Japan is one of the most interesting countries in the world, consisting of a long chain of islands separated from the eastern coast of Asia by the seas of Japan and Okhotsk, and extending from 24° to 50°40' N. lat., and 124° to 156°38' E. long. It descends from the Kurile Islands south-west to the Loochoo group. Southern Saghalien was ceded to



MAP OF JAPAN.

Russia for the Kuriles. The empire is called by the natives Dai Nippon, or "Great Japan," but Nippon is often employed alone. Nippon means literally "sun's origin," i.e. the land over which the sun first rises. The principal islands are:—Hondo or Honshiu, i.e. the Main Island, not known by any other name, Kiusiu, Shikoku, Yezo, Sado, Tsushima, Hirado, Awaji, Oshima, Iki, the Oki group, the Goto group, the Bonin group, the Riukiu group (Loochoo), the Kurile group. The islands, over 4,000 in number, embrace 147,697 square miles.

Political Divisions and Population. Japan is divided into provinces, but for purposes of administration the whole empire except the Hokkaido has been again divided into three cities (*Fu*) and forty-three prefectures (*Ken*). The three cities are Yedo, Ozaka, and Kioto. In 1869 Yedo received the name of Tokio or *Eastern Capital*, as opposed to Saikio, *Western Capital*, the new name for Kioto, in consequence of the removal of the Emperor's court from his old capital to Yedo. But while the Japanese invariably speak of Tokio, they still adhere to Kioto, not Saikio. The limits of the Ken are irrespective of the boundaries of provinces; many Kens contain several provinces or portions of different

provinces. In 1878-9 the Okinawa Ken was created, including the Riukiu (Loochoo) group, till then governed by a chief of its own, though it had for many years sent tribute to both China and Japan. The question of double allegiance was solved by Japan asserting its sovereignty, the king receiving the title of Noble of Japan. Whether this may not embroil it with China is not yet definitely settled. The population in 1890 was 40,453,461, almost 274 to the square mile, a remarkable fact considering that only one-sixth of the empire is cultivable. The principal cities are—Tokio, population (1891), 1,155,290; Ozaka, 473,541; Kioto, 289,588; Nagoya, 170,433; Kobe, 136,968; Yokohama, 127,987; Nagasaki, 58,142; Hakodate, 56,677; Nügata, 47,019: these, except Kioto and Nagoya, constituting the Treaty Ports, where foreigners can reside or visit without a passport. Though so many Europeans visit Japan, there are few resident; 5,498 out of the 9,707 foreigners resident in 1891 were Chinese, 1,748 English, 972 Americans, 559 Germans, 353 French, 123 Portuguese, 77 Dutch, 60 Austro-Hungarians, 58 Danes, 54 Swiss, 50 Russians. As a general rule, the liberties of the Treaty Ports extend 10 *ri* [25 miles] in any direction; but Tokio has special limitations, and at Kobe one is not allowed to approach within 25 miles of Kioto without a passport. In return for being confined to treaty limits, foreigners are exempt from Japanese jurisdictions and subject only to their own consular courts. There are also restrictions on import duties. Treaty revision is one of the burning questions of Japan.

Physical Aspect and Climate. The climate of Japan, from the great length of the chain of islands, varies a great deal: the Loochoo and Bonin islands, lying close to the tropics, enjoy perpetual summer, while the Kuriles, in the far north, share the temperature of Kamschatka, due to the cold arctic currents of air and water. The climate of the four great islands and the Loochoos is chiefly regulated and influenced by the monsoons and the Kuroshiwo, the Japan gulf-stream. The monsoons are warm, southerly winds in summer and cold N. or N.W. in winter. When the S.W. monsoon sets in in April, it brings much rain and a higher temperature, and summer and the rice cultivation commence. Light winds, frequent rain, though sometimes interrupted for weeks, and a comparatively high temperature, distinguish the warm season in Japan, and exert a surprising influence on vegetation. When, again, at the autumnal equinox, the last heavy rains of the season are over, and the prevailing wind is N.W. or N., the dryer season commences. Water disappears from the fields, and the rice harvest is now at hand. By the end of October winter is imminent; the northern monsoon is not only cold, but sometimes very violent; when it blows hard for several days, a clear sky, a high barometer, and low temperature follow. At Tokio the average number of frosty nights is 67, extending from November to March; the mean temperature of the four hottest months, June, July, August, and September, is 74° Fahr.; the highest, 93° to 95° Fahr., being at the end of July or early in August. It has been known as high as 104°. Mention should be made of the violent revolving storms known as typhoons, which

are closely related to the West Indian hurricanes and to the cyclones of the Indian seas. These generally occur in July, August, or September; they cause great damage, not only to shipping, but also to property on land. Large trees often snap like twigs, while the roofs and chimneys of foreign-built edifices suffer severely. As a rule, one of these storms is experienced every year. No country has been more scourged with earthquakes than Japan; they are so frequent that a seismological society has been formed, with its headquarters in Japan, under Mr. John Milne, F.R.S. Destructive earthquakes have often taken place. Tradition says that Mount Fuji was thrown up and the great lake Biwa formed by an earthquake in 282 B.C. The earliest authentic instance was in 460 A.D., when the palace at Kioto was thrown to the ground. In 1702 the Titanic walls of the castle of Yedo were destroyed, in spite of their tremendous *batter*, and the road leading through the pass of Hakone completely closed up. On October 28th, 1891, occurred the most destructive earthquake on record, in which 130,000 houses were destroyed, 10,000 persons killed, and 20,000 injured. The Seismological Society has been able to define the localities most liable to earthquakes, but not to prognosticate their approach; it has discovered, however, that the shock to buildings can be diminished by building them in deep excavations.

The other curse of Japan is floods; they are frequent, especially in early summer, when the snow melting on the mountain ranges causes at times an almost incredible down-flow from the higher lands. These floods occasion great destruction of property, as the rice lands are destroyed by the fine sand from the beds of the rivers swept over the fields during inundation. Whole towns, too, are not infrequently carried away. The rivers, even where of large volume and navigable, are, from the nature of the country, not long. The principal are the Tonegawa, 170 miles long, on a branch of which Tokio stands. The Shinano-gawa and Kiso-gawa, both of which take their rise in the province of Shinano, rank next. Besides these there is Yodogawa, which carries the waters of the Biwa Lake through Osaka into the inland sea, on a branch of which Kioto stands. Navigation is conducted by the Biwa Canal, recently constructed by native engineers, a magnificent work, connecting by a series of locks the great lake with the sea-port. The Isha kari in Yezo is famous for its salmon. The Biwa-Ko (Ko=lake), 50 miles long, and at its broadest about 20 miles broad, is the largest and most noteworthy of the Japanese lakes; its shores are the classical ground of Japanese history. It is equidistant from the Japanese Sea and the Pacific Ocean. After Biwa may be noted the lakes of Chiu-zenji and Hakone, both far above the level of the sea. Chiuzenji is situated at the foot of Nantai-zan, in the Nikko range. Its scenery has given rise to the proverb that he who has not seen Nikko should not pronounce the word "beautiful." The Hakone Lake lies in the Hakone Hills, just east of Fuji-san; the water is exceedingly cold, and according to Japanese legend has never been fathomed. The hill scenery around is very picturesque, and large

numbers of foreign residents visit it during the summer months. A curious feature of Japan is that, although it abounds in bays and harbours, the natives never name them; such names as Gulf of Tokio, Gulf of Osaka, have been given by foreigners. The most famous piece of protected water is the Inland Sea, cut off from the ocean by the narrow Straits of Akashai and Idzumi at the eastern entrance, and by the Straits of Shimonoseki at the western. The attack on Shimonoseki, in 1864, by an allied squadron of English, Dutch, French, and American vessels, in retaliation for injuries inflicted upon foreign shipping passing through the Straits by the batteries erected by the lord of Choshu, is historical. The current in these Straits is so swift that vessels have difficulty in stemming it unless under steam. The Inland Sea abounds in fertile islands and safe anchorages. The general aspect of Japan alternates between mountain ranges, rugged upland regions, and wide plains, some very sandy. The north of the main island is exceedingly mountainous; in the south-east lies the wide plain of Yedo, remarkably fertile, and closed in by lofty ranges. From this to the west the country is hilly in the centre, with lower ground north and south. The large islands of Kiushu and Shikoku are chiefly high ground.

Japan, as might be expected in a country where volcanoes are so numerous, is very hilly; in the south there are many mountains of considerable height, the most famous of which is the extinct volcano, Fuji-san, erroneously termed Fusi-yama, which rises more than 12,373 feet in a truncated cone, the most beautiful mountain in the world, depicted so often in Japanese art; its last eruption was in 1707. Next to Fuji-san comes Asama-yama, 8,500 feet, which had an eruption as late as 1870, and Nantaizan, the Sacred Mountain, the loftiest in the Nikko range. Besides these there are the exquisite Hakone Hills, whose blue sierra bounds the horizon of the view from Tokio and Yokohama. The bulk of the population lies in a few great plains like the plain of Yedo.

Government and Statistics. From the time of the Taira and Minamoto up to 1868 the government of Japan was dual, the nominal ruler being the Mikado, the virtual the Shogun or Commander-in-Chief, whose accession was officially confirmed by the Mikado, though as the head of the clan princes or Daimios, and in possession of the eastern and more important portions of the empire, the power was in his hands. When Will Adams conducted an expedition to Japan three centuries ago, the ruler mentioned in his letters was not the Mikado, but the Shogun Iyeyasu, and when Commodore Perry of the United States Navy went to open up Japan willy nilly forty years ago, he dealt not with the Mikado, but with the descendant of Iyeyasu. But in 1868 a few great clans like Satsuma and Choshu rose to help the Mikado throw off the military despotism of the Shogun, and he became Sovereign *de facto* as well as in name. The system of government was then an absolute monarchy, till a constitution was promulgated February 11th, 1889. "By this," according to the Statesman's Year-book, "the Emperor is head of the empire,

combining in himself the rights of sovereignty, and exercising the whole of the executive powers with the advice and assistance of his cabinet responsible to him, and appointed by himself. There is also a privy council, who deliberate upon important matters of state when they have been consulted by the Emperor, who can declare war, make peace, and conclude treaties. He exercises the legislative power with the consent of the Imperial Diet. It is his prerogative to give sanction to laws, convoke the Imperial Diet, open, close, and prorogue it, and dissolve the House of Representatives. The Imperial Diet consists of two Houses, a House of Peers and a House of Representatives. Every law requires the consent of the Imperial Diet. Each House may initiate projects of law, make representations to the government as to laws or upon any other subject, and present addresses to the Emperor. The House of Peers is composed of—1, male members of the imperial family of the age of 20 and upwards; 2, princes and marquises of the age of 25 and upwards (11 princes and 28 marquises); 3, not more than one-fifth of the 80 counts, 355 viscounts, 29 barons, respectively of the age of 25 and upwards, elected by the members of their respective orders; 4, persons above the age of 30 years, nominated by the Emperor for meritorious services to the state or erudition; 5, persons who shall have been elected in each Fu and Ken from among and by the fifteen male inhabitants thereof, of above the age of 30 years, paying therein the highest amount of direct national taxes on land, industry, or trade, and have been nominated by the Emperor. The term of membership under 3 and 5 is seven years; under 1, 2, and 4 for life. The number of members under 4 and 5 not to exceed the number of other members. The entire membership of the House of Peers is to be about 300. The members of the House of Representatives number 300, a fixed number from each election district.

"The President and Vice-President of the House of Peers are nominated by the Emperor from among the members, and President and Vice-President of the House of Representatives are nominated by the Emperor from among three candidates elected by the House. The Presidents of both Houses receive an annual salary of 4,000 yen; Vice-Presidents, 2,000 yen; elected and nominated members of the House of Peers and members of the House of Representatives, 800 yen, besides travelling expenses. No one is allowed to decline these annual allowances. The Imperial Diet has control over the finances and the administration of justice. Voting is by secret ballot, and the system is that of *scrutin de liste*. The Diet must be assembled once every year. The Cabinet, which is very autocratic according to our ideas, consists of a Minister, President, Ministers of State for Home Affairs, Foreign Affairs, the Navy, Agriculture, and Commerce, Justice, Financial Affairs, the Army, Education, Communications, and various Secretaries. At the head of local administration in the provinces are the Governors, one residing in each of the 46 districts (3 Fus and 43 Kens) into which Japan is divided. In 1879 city and prefectural assemblies were created, based on the principles of

election; their power is confined to fixing the estimates of the local rates, subject to the confirmation of the Governors, and, finally, of the Minister of the Interior. Eligible to the Assembly are all male citizens twenty-five years of age, resident in the district at least three consecutive years, and paying land tax of more than 10 yen annually. The franchise is conferred on all male citizens of 20 years residing in the district, and paying more than 5 yen land tax annually or biennially; Governors are summoned to the Department of the Interior to deliberate upon matters of local administration. Each district is subdivided into cities (*ku*) and counties (*gun*), each with its chief magistrate (*cho*), who manages local affairs. The island of Hokkaido (*Yezo*) has a Governor and a special organisation. To further carry out the principle of decentralisation and self-government, a system of local administration in *shi* (municipality), *cho* (town), and *son* (village) was established by Imperial rescript, April 17th, 1888, which came into effect April 1st, 1889, and is to be applied gradually according to the circumstances and requirements of these localities."

The *army* consists of 78,017 men on a peace footing, and may be increased to 245,521 in time of war. The *navy* consists of—ironclads, 1; coast defence, 18; despatch, 2; gun-vessels, 6; 24 first-class torpedo boats and sea-going torpedo boats, and a few vedettes, also 8 unarmoured ships and a few training ships; it is manned by 10,887 officers and men.

Estimated public revenue, 1890-91	...	£16,672,594
Estimated public expenditure, 1890-91	...	15,492,450
Total debt, March, 1890	...	59,102,164
Total imports, 1891	...	13,280,894
Total exports, 1891	...	9,581,322
Imports from United Kingdom, 1891	...	3,060,893
Exports to United Kingdom, 1891	...	1,152,585

The *history* of Japan is not important, except where foreigners touch it, till the revolution of 1868, when the Shogun was declared an usurper, and the great clans of Satsuma, Choshu, and Tosa warmly espoused the cause of the Mikado. The Shogun himself had resigned in 1867, and this virtually settled the question; although some desultory fighting occurred both at Yedo and near Hakodate two years afterwards. In 1869 the Mikado removed to Tokio from Kyoto with his court. The ex-Shogun retired to Shidzuoka, where he still lives in retirement, his title being that of a noble of the empire. The ancient form of government was thus restored, and the feudal system is now a thing of the past. Since this revolution Japan has become tolerably well known to Europeans.

Characteristics. The Japanese have a drink peculiar to themselves—*sake*, brewed from rice. They eat many kinds of sea-weed. Their buildings, from the humblest wood and paper cottages to the largest temples, and castles of the Daimio built of enormous stones, are alike unattached to foundations, as a protection against earthquakes. The scenery resembles a willow-pattern plate. Where they have water the bluffs are cultivated to the very tops with paddy-fields (rice). There are immense avenues of cryptomeria (Japanese cedar and pine); on the road from Tokio to the temples of Nikko there is one nearly fifty miles long. The principal forests consist of

these trees, with the ilex, maple, mulberry, and giant camellia. The last-named, rising to a height of thirty or forty feet, with brilliant single scarlet blossoms, and the camphor wood, are much planted round temples. Bamboo clumps are seen everywhere, and the use of the bamboo for almost every purpose is one of the characteristics of Japan. Of fruit trees Japan possesses the orange, apple, walnut, chestnut, plum, persimmon, damson, peach, vine, and loquat. The fruit is inferior—indeed, the cherry tree exclusively and plum tree to a large extent are cultivated for their blossom. The Japanese carry to extraordinary perfection the cultivation of certain flowers, such as the double plum, peach and cherry blossoms, the wisteria, camellia, chrysanthemum, iris, and tree peony; and in the summer every piece of shallow water is carpeted with the lotus. The most valuable vegetable products are tea, vegetable wax, camphor, cotton. The lacquer tree is dying out; the most peculiar vegetable product is the gigantic radish, *daikon*—it is often a yard long and as thick as a man's arm. The Japanese eat hardly any meat or bread—fowls, fish, eggs, and rice, with various sauces, forming their savouries. What mutton there is comes from Shanghai. The wild animals are bear, deer, antelope, fox, monkey, badger, etc., the larger chiefly confined to Yezo. The horses are mere shaggy ponies; there is a valuable breed of black-and-white long-haired pugs. Among birds are the stork, cormorant, swan, various kinds of geese and ducks, pheasant, woodcock, pigeon, plover, snipe. Larks, swallows, and sparrows are as common as in England. Among fish are herrings, bonito, cod, sole, crab, lobster, salmon, eels, oysters. The most esteemed is *tai*, a large species of carp.

Religions and Temples. Japan has two religions, as it formerly had two authorities, the *Shinto* and the *Buddhist*; by the former is meant the religious belief of the natives prior to the introduction of Buddhism. Shinto means literally the "way of the gods." No concise definition of it appears to exist; it contains no moral code, a high Japanese authority on the subject even asserting that in Japan there was no necessity for any system of morals, as every Japanese acted right if he only consulted his own heart. He also declared the whole duty of a good Japanese consisted in obeying implicitly and without question the commands of the Mikado. In *Shinto* Japan is held to be the country of the gods, and the Mikado the direct descendant and actual representative of the sun-goddess. In it there also seems to be mixed up a system of hero-worship, many renowned warriors and other personages of ancient days being exalted into what we should term demi-gods; thus it inculcates a reverential feeling towards the dead. By it, too, spiritual agencies are attributed to the elements or natural phenomena. The *Shinto* shrines throughout the country are very simple, being generally constructed of white wood unadorned by brilliant colouring as in Buddhist temples, and roofed with thatch. Before each shrine stands one or more *torii*, archways formed of two upright posts with a projecting cross-bar laid on their summits, beneath which is a smaller horizontal beam, the ends of which do not project. The most famous Shinto shrines are the

temples of Ise—the Mecca of Japan. The special peculiarity distinguishing pure Shinto shrines from Buddhist temples is the absence of images; but they nearly always contain some object in which the spirit of the deity has its shrine, such as a mirror for the sun-goddess or a sword for the god. Buddhism was introduced into Japan in 552. [BUDDHISM.] The most famous Buddhist temples, with a bewildering richness of painted carving outside, and the finest gold lacquer in the world within, are the mortuary shrines of the Shoguns at Nikko, Shiba, and Ueno. There are two famous colossal bronze statues of Buddha in Japan—the Nara Daibutsu, 53 feet high, cast in A.D. 749 (its head, destroyed by fire, has twice been renewed, in 1195 and 1567), and the much more beautiful Daibutsu at Kamakura, 49 feet 7 inches high, cast in 1252. In 1890 there were 193,242 Shinto temples, tended by 14,717 priests, many of them being mere roadside shrines, and 72,154 Buddhist temples, tended by 52,607 priests (bozu). There are said to be over 14,000 Shinto gods. There are 250,000 professing Christians of various denominations. Japan swarms with missionaries of all sects. Tokio has even a Greek Church.

Industry: Commerce: Communication. The Japanese are a manufacturing and agricultural people. The land is chiefly cultivated by peasant proprietors, the holdings being very small as a rule, and devoted to rice. Out of the 147,697 square miles some 11,500,000 acres are under cultivation, 44,500,000 acres forest, 18,000,000 open field, 9,000,000 Crown lands. Of the cultivated land in 1891, 6,756,904 acres were devoted to rice, 1,043,718 acres to wheat, 1,590,559 to barley, 1,565,378 acres to rye. In 1890 there were raised about 50,000,000 lbs. of tea, 180,000,000 lbs. of sugar, and 10,000,000 lbs. of raw silk. The principal metals are silver, copper, and iron; the principal minerals coal and sulphur. In 1890 Japan had about 1,000,000 cattle and 1,500,000 horses. There are over 250,000 fishing boats, and nearly 1,000,000 persons engaged in fishing. In 1890 silk and cotton, etc., were manufactured to the value of 33,040,151 dollars (2s. 9d.), and 70,000,000 lbs. to 80,000,000 lbs. of cotton-yarn; the other leading industries being ship-building, paper-making, matches, soap, ropes, cement, glass, bricks, porcelain, lacquer, bronze, etc. The principal exports in 1891 were: raw silk and cocoons, 32,093,017 dollars; tea, 7,033,050 dollars; rice, 6,213,495 dollars; coal, 4,749,735 dollars; copper, 2,828,580 dollars; dried fish, 2,299,079 dollars; porcelain, bronze, lacquer, etc., 2,500,000 dollars; camphor, 1,629,105 dollars; silk textiles, 4,782,459 dollars. The principal imports were: cotton-yarn, 5,673,083 dollars; sugar, 7,811,306 dollars; wool and woollens, 3,534,787 dollars; metals, 5,164,803 dollars; petroleum, 4,535,720 dollars; drugs, 2,088,887 dollars; dyes and paint, 1,084,362 dollars; machinery, ships, etc., 3,982,823 dollars; beverages and provisions, 7,423,579 dollars; calico, 1,656,681 dollars. Trade is chiefly with America. Exports, 31,138,422 dollars; imports to Japan, 6,860,883 dollars. Great Britain. exports, 5,633,137 dollars; imports, 19,996,050 dollars. France, exports, 15,120,075 dollars; imports, 2,834,025 dollars. China, exports,

5,825,851 dollars; imports, 8,798,428 dollars. Germany, exports, 1,456,596 dollars; imports, 5,127,476 dollars. East Indies and Siam, exports, 989,001 dollars; imports, 5,642,551 dollars. Korea, exports, 1,466,040 dollars; imports, 4,032,922 dollars. The staple imports from Great Britain are cottons and woollens, iron, machinery, and chemicals.

The merchant navy of Japan in 1890 consisted of 586 steamers and 865 sailing vessels of European build (145,692 tons). Japan has one of the principal steamship companies of the world, the Nippon Yusen Kaisha, capital £2,000,000, wholly subscribed by Japanese. The fleet consists of over 60 vessels, including 52 large steamships, while new vessels with all modern improvements are continually being built, chiefly on the Clyde, to meet the rapidly increasing trade between Japan, Korea, China, the Pacific ports of Russia, Hong Kong, and the Sandwich Islands. Japan is as well lighted as most western nations. Though all have been erected by foreign engineers during the past fifteen years, there is hardly a promontory or island lying in the direct track of shipping without a lighthouse. There were over 1,698 miles of railway open in September, 1891, and lines in construction in every direction, but the rolling-stock is not luxurious. In 1890 there were 8,004 miles connected by telegraph, and 202 by telephone, 309 telegraph offices, and 2 exchange and 18 calling telephone offices with 821 subscribers: 4,129,610 telegrams were sent. In 1890 the Imperial Post Office delivered 176,606,883 letters, 41,255,681 newspapers and pamphlets, 2,565,178 books, 216,745 parcels. There are over 21,000 miles of road, 5,000 being state-roads. The great state-roads of Japan are famous: the principal highways are 11 in number, the best known to foreigners being the Tokaido, 320 miles long, and the Nakasendo, 330 miles long, both connecting Tokio and Kioto, and the Hokkaido, running right through the island of Yezo. There are few carriages in Japan, except those belonging to the court and high officials and legations. The vehicles most in use are a few tramways and omnibuses in Tokio, small stage waggons of various sizes like old-fashioned carriers' carts, jinrikishas and kagos—the latter rude basket-work palanquins, carried by a couple of coolies, used for the mountains or where there are no roads. At a few places saddle-horses may be hired. But the ordinary conveyance of Japan is the jinrikisha, a sort of light two-wheeled buggy drawn by a coolie (or for long or difficult journeys by two coolies). The coolie can run about six miles an hour, and do his thirty miles a day comfortably. Strangers in treaty ports pay about 6d. an hour, natives in the country about 2d.

In Japan everything is reckoned in yen (dollars), present value about 2s. 9d., and sen (cents). There are gold 5-yen pieces (but the only gold coins ever seen are English or American), silver and paper yen, silver 50-, 20-, and 10-sen pieces, nickel 5-sen pieces, and copper 1- and 2-sen pieces, besides the base-metal coins of lower denominations; a yen = 100 sen. Recently some of the national banks have taken foreigners' accounts, like the foreign banks in Yokohama, Kobe, and Nagasaki; but as late as

1891 there was no bank with the ordinary facilities in Tokio.

The articles of manufacture by which Japan is best known to the world are its silks, porcelain, pottery, lacquers, bronzes, carvings, cloisonné, and sword-blades. Japanese ceramic art dates, roughly speaking, from the year 1600; it reached its zenith about 1750-1830. The most famous kinds are the Hizen, Kyoto, Satsuma, Kutani, Owari, Bizen, Takatori, Banko, Izumo, and Yatsuhiru. There is an immense shipment of low-class porcelain made for the European markets from Nagasaki.

Law and Police. Crime is common in Japan in spite of the gentleness of the people. There were, at the close of 1890, nearly 70,000 people in prison; the police are much in evidence. Each of the 46 Fns and Kens has a *Court of First Instance*, besides nearly 300 *Courts of Peace* for petty offences. There are seven *Courts of Appeal*, having appellate jurisdiction over civil and criminal cases decided in the *Courts of First Instance*, and there is a *Court of Cassation* at Tokio, which takes cognisance of civil and criminal appeals. In 1890 there were 3,260 serious crimes, and 137,268 lesser.

Education. Tokio has a magnificent university, with five faculties: law, literature, science, engineering, and medicine. The college of medicine is under exclusively German influence, though there are also some Japanese professors. The other colleges have chiefly Japanese, German, and English professors. The students numbered, in 1890, 1,376; the Japanese showing a special aptitude for engineering and other sciences in which mathematics are applied. Other Government educational establishments are—the Higher Normal School, Higher Commercial School, the Technological School, the Nobles' School, the naval and military academies in Tokio, and six higher middle schools in the provinces. The 2,607 elementary schools in 1890 had 67,730 teachers and 3,096,000 pupils; in 1890 Japan had 20 libraries with 179,332 volumes; 18,720 books were published, and 716 periodicals in circulation. There are several foreign newspapers published at Yokohama and Kobe. Some Tokio native papers circulate all over Japan. The native press is under very strict censorship, suppressions, fines, and imprisonment being of almost daily occurrence.

Ethnology.—The present inhabitants of Japan are a Mongoloid people who, according to the national traditions, arrived from the south and south-west, and gradually spread over the Archipelago, driving the original Ainu inhabitants northward to Yezo. Many doubtless arrived from the southern Malay lands; but their speech and other indications show that most probably the majority, or the dominant classes, came from Korea. Evidences abound of the intermingling of both races, resulting in a distinct Japanese type, the salient features of which are a flat forehead, great distance between the eyebrows, nose small but well formed with raised nostrils, no glabella nor any depression at the root of the nose, small black eyes slightly less oblique than the Chinese, long black hair, scant beard, sallow or dirty olive-yellow complexion, but almost fair amongst the upper classes, low stature, averaging not much above five feet.

Their arrival cannot date from a very remote period, for the Yebisu-no-Kuni ("land of the savages") still comprised the northern extremity of Nippon so recently as the 7th century of the new era; nor was the Mikado's authority completely established over the whole of Japan proper till the beginning of the 9th century. Compared with the Chinese the Japanese are a feeble folk, with slight muscular development, contracted chest, and a marked tendency to anæmia, due partly to the hot, damp climate, partly to the poor and monotonous national diet of rice varied with a little fish or pickled vegetables. Nevertheless, the lower classes are vigorous, pliant, nimble, great runners, acrobats and wrestlers, with remarkable staying powers, in



JAPANESE MAN AND WOMAN.

apparent contradiction to their generally weak constitution. They are extremely industrious and painstaking in all their pursuits, hence the extraordinary perfection to which certain arts, such as porcelain, pottery, japanning, metal work and decorative painting, have been brought. Morally and intellectually they rank far higher than the Chinese, being highly intelligent, progressive, bright, quick-witted, genial, cheerful, and brave to a degree of heroism unsurpassed by any nation. The sense of personal honour became a passion under the mediæval feudal system, and led to astounding acts of devotion and self-sacrifice, as well as to deeds of incredible ferocity, of almost daily occurrence. The imitative faculty surpasses even that of the Chinese, as shown by the fact that their first steamer with engines complete was constructed solely from a description in a Dutch treatise on the subject. The *yamato*, or primitive Japanese language, is polysyllabic, euphonious, and agglutinating, showing remote affinities with the Korean, but none with the Malay. The structure is extremely simple, with no true declension or conjugation, the formative relations being indicated by post-positions and auxiliaries. It is spoken in its purity only amongst the highest classes, being replaced in other circles by the Sino-Japanese, in which Japanese and Chinese words are intermingled in about equal proportions. The numerous writing systems are also all based on the Chinese ideographs, out of which have been evolved the *katakana* ("side script"), and its cursive form the *hiragana* ("united script"), a system of forty-seven characters possessing syllabic force, and consequently an immense advance on the Chinese ideographic method, though still inferior to the perfected alphabetic system of the western nations.

Japan Copper, a commercial variety of copper which possesses a fine purplish-red colour owing to the presence of a thin coating of red oxide of copper. It is obtained by casting water upon the molten or hot metal, or by casting the metal in ingots under water.

Japanese Sparrow (*Liothrix luteus*), one of the Indian hill tits, ranging to China and Japan. The plumage is olive-brown, with an orange patch on the breast, and each wing-feather is edged with deep orange.

Japanning. The term japanning is applied to a mode of lacquering articles which is extensively practised in Japan, as in the formation of the well-known Japanese papier-mâché tea-trays, etc. For such articles a lacquer obtained from certain Japanese trees is employed, being laid on in successive coats and each thoroughly dried in the sun before the application of the next, until finally a thick, hard, glossy coating is obtained. Different designs may be painted on the article in gold or colours before the application of the final layers. For the japanning of metals the article must be first well cleaned, smoothed, and dried, and is then coated with a layer of lacquer or japan. Each layer is dried by placing the metal in an oven kept at a constant temperature, the regulation of the heat being an important point in the operation. Another layer is then given and again dried, etc., each coating giving a better surface than the previous one, and, if desired, the final layer may be subjected to artificial polishing. Japans of various colours may be employed, formed by mixing pigments of the desired shade with varnish. The latter usually consists of shellac, or a mixture of shellac and resin dissolved in methylated spirits, while as pigments, ivory black, lamp black, white lead, king's-yellow, etc., may be used. In lacquering wood, papier-mâché, plaster, etc., articles, other varnishes specially adapted for the particular purpose are employed, and the articles are dried without making use of the ovens employed for metal work.

Japan Wax, a white, brittle wax with a peculiar resinous odour, which is obtained from the fruit of certain plants, *e.g.* *Rhus sylvestris*, which occur in Japan and China. It melts at about 54° F., and has a specific gravity from .98 to 1.01, so that it usually just floats on water. It is employed for a variety of purposes, as for polishing furniture, in the manufacture of candles, perfumery, etc.

Japura, or CAQUETA, a tributary of the Amazon, has its source in the Colombian Andes, about 25 miles from the town of Mocoa, Colombia, and after a south-easterly course of some 700 miles, during which it skirts the N.E. boundary of Ecuador and enters Brazil, it joins other tributaries near San Antonio de Maripi, previously to their entering the mother stream some 100 miles further south. It is navigable for about 500 miles.

Jargon, or ZIRCON, a rare mineral, in which Klaproth (1789) first indicated the presence of the

element *zirconium*, the compound consisting of a silicate of that metal $Zi Si O_4$. It forms crystals somewhat resembling diamonds but heavier; specific gravity 4.5, and not as hard. It is frequently coloured blue, green, or orange, the latter being the variety most prized as gems. Jargon is found in a number of localities, but Ceylon is the chief source of the mineral.

Jaroslav, a city, the capital of a government of the same name, in the centre of Russia, stands near the right bank of the Volga, and is about 170 miles N.N.E. of Moscow. Its history dates back to the 11th century, and it was for three centuries the capital of an independent principality. The present city has a quay two miles long, and is an important river port, trading largely in corn; cotton stuffs are manufactured in the town, and spinning and weaving employ many inhabitants of the governmental area. Jaroslav is an archiepiscopal see, and has many churches and monasteries, as also a lyceum for law students.

Jarrah (*Eucalyptus marginata*), one of the most valuable timber-trees of Australia. The trees reach a great size, yielding squared logs forty feet long and twenty-four inches across. The wood is hard, heavy, mahogany-red in colour, sometimes beautifully figured, and containing a resin which enables it to stand exposure and to resist the action of sea-water, of ship-worms, or of white ants; but it is somewhat brittle.

Jarrow, a town on the S. bank of the Tyne, 7 miles S.E. of Newcastle. The ruins of the 7th century Benedictine monastery, in which Bede spent his life, are near the parish church, in which is his chair. The modern town dates its rapid rise from the year 1859, when the docks were begun. Ship-building, iron-founding, the making of engines, and the manufacture of chemicals, employ a large number of hands, and much coal is shipped hence. The town received its municipal charter in 1875.

Jasher, BOOK OF, or, according to the revised version, *Jashar*, is one of the lost books of the Hebrew Scriptures. It is quoted twice, Joshua x. 13, and 2 Samuel i. 18. It has been the subject of much speculation; Talmudic and other Jewish authorities variously identified it with Genesis, Deuteronomy, Judges. Dr. Lowth, Herder, and others, following the Syriac and Arabic translators, think that it was a collection of national ballads. Gessenius inclines towards this view, thinking that its name, "the Book of the Upright," arose from the fact that the personages dealt with were upright; whilst Donaldson thinks that it is a work of Nathan and Gad, written during the reign of Solomon. Three forgeries under this name appeared in the 13th century and another in 1751.

Jasmin, JACQUES (1798-1864), Gascon poet and barber, was the son of a tailor at Agen. His real name was Boé. The young Jacques set up as a barber in his native town, but in 1835 published some poems in the dialect of Languedoc. He afterwards published three other volumes, which he called "Papillotos" (curl papers). Among

these were "L'abuglo de Castélcuillè," which Longfellow translated as "The Blind Girl of Castélcuillè," "Françonnetto," and "Charivan," a mock heroic poem. He went about giving public recitations of these, and attained a wide popularity which extended even beyond France. He received a pension from the Académie, and a golden crown from his native town.

Jasmine, or JESSAMINE, the popular name of various shrubs belonging to the genus *Jasminum*, which gives its name to the gamopetalous order Jasminaceæ. Of some sixty species, more than forty are cultivated in our gardens, most of them being natives of the warmer regions of the Old World. They have opposite pinnately compound leaves of one, three, five, or seven leaflets, and cymes of fragrant white or yellow flowers. The calyx is tubular, with narrow limb-segments, and the corolla has a long tube and spreading segments, generally five in number. There are two included stamens and a two-chambered ovary. *J. officinale* is the common white jasmine; *J. sambac*, the white Arabian jasmine; *J. grandiflorum*, the Spanish or Catalonian jasmine, a native of Tobago; *J. frutescens*, the common yellow jasmine; and *J. nudiflorum*, the species which flowers before the appearance of its leaves. *J. grandiflorum* is largely cultivated for its perfume at Cannes and Grasse. In China 10 lb. of the flowers of *J. paniculatum* mixed with 30 lb. of those of *J. sambac* are added as a perfume to 100 lb. of tea.

Jason, grandson of the god Poseidon (Neptune), led the expedition of the Argonauts in quest of the golden fleece. He first married Medea (q.v.), but afterwards repudiated her for Glauke, daughter of Kreon, King of Corinth. His first wife took a terrible revenge, which is the subject of the *Medea* of Euripides (q.v.). The story of the fleece is supposed to be an Ionian sun-myth.

Jasper, an opaque, impure, non-crystalline form of silica, generally red from iron peroxide or brown from its hydrous form. These colours occur in bands in *ribbon jasper*. Bloodstone or heliotrope (q.v.) ought apparently to be classed with the opaque jaspers rather than with the translucent chalcedonies. The jasper of the ancients seems to have been green and translucent, a prase, chrysoprase or plasma.

Jassy, the ancient capital of Moldavia, is mentioned as early as the 14th century. It was burnt by Sultan Soliman in 1538, and by John Sobieski in 1686. It gave its name to the treaty concluded between Russia and Turkey in 1792.

It is situated about 200 miles N. of Bucharest, to which, since the formation of the united state of Roumania, it stands in the position of Edinburgh to London after the Union. It is still, however, the residence of a prefect, and the seat of an archbishop. It has also a university and a large hospital. A large proportion of the population are Jews. There is some river trade with Galatz.

Jats, a widespread aboriginal people of North-West India, Afghanistan, Baluchistan, and Persia,

about whose relations the most contradictory views have been advanced by ethnologists. The word *Jat* has been connected with the *Getæ*, whom Grimm and others suppose to have been *Goths*, and the most prevalent opinion at present is that the Jats really were Aryans, though of a different branch from the Hindus, and possibly Teutons. The fact remains that they are at present of distinctly Aryan type and speech, the Jatki language being a neo-Sanskritic dialect allied to the Panjabi, and spoken by about 1,800,000 in the Indus basin alone. Jat tribes are found scattered all over Baluchistan, some settled peasantry, some nomad camel-breeders, others even itinerant like the Gipsies, but all now Mohammedans. In Zachi they cannot be distinguished from the aborigines, and seem allied to the Jataks and to the Jattâkis of the Jatak Hills, Brahuik Range. In the Panjab they are mostly Sikhs, that is, members of Nanek's sect, and in Rajputana, where they form the substratum of the population, they are Hindus chiefly of the Vaishnava sect. If the Sikhs be taken as a typical branch of the family, then the Jats must be pronounced one of the finest races physically in the world. [SIKHS.] But the type varies greatly, and some of the peasantry are of low stature, with small eyes, prominent cheek bones, and very dark complexion.

Jaundice is the term applied to the condition in which the colouring matter of the bile circulates with the blood, and is deposited in the tissues instead of being removed from the body by way of the alimentary canal. Though non-elimination of colouring matter is the striking visible sign, the symptoms of jaundice are probably due to the retention within the system of other constituents of the bile. In determining the existence of jaundice, it is important to note whether the conjunctivæ are discoloured, as, in several maladies which simulate the disease, the conjunctival mucous membrane is not affected. Again, in jaundice there is an alteration in the colour of the discharges from the lower bowel, while there is, on the other hand, an increased amount of pigment in the urine. In some cases of jaundice there is obvious obstruction to the passage of the bile from the bile duct into the duodenum; as, for example, by a calculus, or by pressure from abnormal growth in parts surrounding the duct. In the case of what is known as catarrhal jaundice, it is assumed that inflammation of the mucous membrane of the duct leads to obstruction to the flow of bile through it. As there is some doubt as to the existence of this inflammatory condition in all cases, it is better to employ the term *simple jaundice* in such instances. Jaundice is produced by certain poisons, notably phosphorus; it also occurs in some forms of acute disease, and is a characteristic symptom in yellow fever. It may be produced by disorganisation of the substance of the liver, and by interference with the circulation of blood through it, such as occur in the various hepatic disorders. Lastly, what is known as malignant jaundice should be especially alluded to. This malady is sometimes spoken of as acute yellow atrophy of the liver, and in it the

symptoms rapidly assume a serious character, with grave cerebral disturbance, and death usually occurs within a week. In simple jaundice, which is the most common form in which jaundice presents itself, the symptom subsides in the course of a few weeks, and it seldom calls for special treatment beyond the regulation of the digestive functions.

Jaunpur, a town and district in the north-west provinces of India. The town, which stands on the Gumti river, was once the capital of a Mohammedan kingdom. Traces of its former glory are to be seen in Ibrahim's baths (15th century), and the ruins of mosques. Jaunpur was a centre of disaffection during the Mutiny. It has two railway stations, and a considerable trade.

Java, a large and fertile island in the East Indies belonging to the Dutch, lies between $5^{\circ} 52'$ and $8^{\circ} 51'$ S. lat., and $105^{\circ} 15'$ and $114^{\circ} 35'$ E. long. It is separated from Sumatra by the Sunda Strait on the west, and from Bali by the Strait of Bali on the east. It is 630 miles long (west to east), and varies in breadth from 60 to a little over 120 miles. Including Madura and some smaller islands, the total area of Java is nearly 52,000 square miles.

History.—Hindu states began to be formed in the island from the 9th century onwards; Mohammedanism was introduced at the beginning of the 15th century; and in the next century the Dutch came. Their East India Company, after a struggle of three centuries with the natives, gradually extended its dominion over the whole of Java. During the Napoleonic wars the French seized the kingdom of Bantam, but the whole island was soon after occupied by the British and held by them till 1817. A rebellion against the Dutch broke out in 1825, and lasted for five years, after which their hold on the island was permanently secured.

Physical Features, etc.—Java is very mountainous, and contains a large number of volcanoes, many of which are still active. The highest, Semeru, is more than 12,000 feet high. There are very few large rivers. Some large bays on the north of the island contain good harbours. The temperature is continuously high, but is seldom extreme. The rainy season is from November to March; in the west there is more rain than in the east. The vegetation is very rich, and varies according to altitude. The flora of the highest region is European in character. There is a little gold, but minerals of all kinds are rare. There are large forests, but little timber is cut. The rhinoceros is the largest mammal found in Java. Wild swine abound, and there are not a few tigers in the forests, while the leopard is also common; there are two species of deer, and crocodiles and several kinds of serpent are found. Java is remarkable for its bats, especially one known as the flying-fox. The birds are unimportant.

Agriculture, Trade, etc.—Rice and maize are largely grown, chiefly for native consumption. Coffee and sugar are cultivated for exportation, and have brought great wealth to the Dutch Government. By a system introduced by Governor van

den Bosch in 1830, the natives were made to work the plantations and sell at a fixed price to the Government magazines. This was much disliked by the cultivators, and was to a large extent modified in 1873; but so late as 1889 a commission was appointed to consider the question of coffee-planting. Tobacco and tea are also exported, the trade being chiefly with Holland, the Straits Settlements, and Great Britain.

Administration, etc.—Java is governed by a governor-general and council. It is divided into twenty-two residencies, each under a European official, who has judicial, financial, and administrative functions. A native functionary known as the regent, appointed by the governor-general and paid by the government, has important consultative functions, but little executive authority. Europeans form but a small proportion of the population; the rest are Malays, divided into Javanese, Sundanese, and Madurese. Batavia is the capital, Sombaya and Samarang, on the northern coast (the former opposite Madura), being the towns next in importance to it. Communication by roads and railways is good, and the telegraph system is efficient.

Ethnology. Java was originally inhabited by a Negrito people akin to the Aëtas of the Philippines, of whom the last survivor, a gardener in Buitenzorg, died about the year 1886. The present population forms four distinct ethnical groups, all of Malay stock: 1. The *Sundanese* in the west, as far as the province of Cheribon, distinguished both by their rude Malay dialect and by their coarse physical type, vigorous constitution, and independent bearing; 2. The *Javanese* in all the central districts from Cheribon inclusive, east to the meridian of Madura Island, of softer physique and more refined habits; head highly brachycephalous; small nose, less flat and broad at base than that of most Malays, face more elongated, cheek bones less prominent, black hair and eyes, yellowish-brown complexion, short stature, averaging five feet three or four inches; 3. The *Madurese* in the extreme east and adjacent island of Madura, not differing greatly in appearance from the Javanese, but of somewhat ruder habits and speech; 4. The true *Malays*, forming numerous trading communities in all seaports along the north coast. Although, like all Malays, subject to occasional fits of uncontrollable frenzy, the Javanese are generally of a mild disposition, peaceful, industrious, and skilled in many crafts, such as metal working, weaving, dyeing, pottery, as well as in the arts of music and poetry. They are excessively polite and ceremonious, as shown in their soft Malay language itself, of which there are no less than four distinct forms. 1. *Krama*, the noble style, used by inferiors to superiors; 2. *Ngoko*, the simple style, used by superiors to inferiors; 3. The *Madya*, used by equals to equals; 4. The *Basa Kraton* ("Court language"), used in presence of princes. Besides these there is the extinct *Kari*. The earliest Javanese culture was developed under Hindu influences, and the bulk of the people were followers of various Brahmanical sects down to the close of the 15th century, since which time all have been Sunnites (orthodox Mohammedans), though retaining many

Hindu practices. They also retain the writing system based on the Indian Devanagari, whereas the Malays proper, like most other Mohammedans, have adopted the Arabic alphabet, though ill suited to express the sounds of their melodious speech.

Java Sparrow, or Rice-bird (*Amadina oryzivora*), a well-known cage-finch, about the size of a house-sparrow. The plumage is bluish gray, with white ear-coverts.

Jaxartes, or SIR-DARIA, a river which rises in the Thian-Shan mountains between China and Turkestan, at a height of 12,000 feet. It has a total course of 1,500 miles, and is navigable for about 800 miles from its mouth. It bears three separate names in its descending course, and is not called Sir-Daria (river) until about the middle of its length. From Khojend, some way above this point, it takes a northerly direction, and ultimately empties itself into the sea of Azal below Aralsk. Its water is used for irrigation purposes like that of the Nile.

Jay, any bird of the Corvine genus *Garrulus*, with twelve species from the Palearctic region. The Common Jay (*G. glandarius*) is British, and one of the handsomest of our native birds. The adult is about 13 inches long. General plumage—vinous-red above, paler on the under surface, fading



JAY (*Garrulus glandarius*).

into white on the vent and under tail-coverts; the black wing-coverts are barred with blue and white, and there is an erectile crest of whitish feathers streaked with black. Like the rest of the genus, it is an omnivorous feeder, devouring the farmer's fruit and the eggs of the game-preserver, though it makes some amends by consuming numberless insects and their larvæ and waging war upon mice. It has considerable power of mimicry, and is often

kept as a pet. Allied genera are found in the New World.

Jay, JOHN (1745–1829), an American statesman, was born at New York. After graduating at what is now Columbia College, he went to the Bar and obtained a large practice. He was a delegate to the Philadelphia Congress of 1774, and drew up the Address to the People of Great Britain. He was also a member of the second Congress, but was prevented by absence from signing the Declaration of Independence. He drafted the constitution of New York State, of which he became Chief Justice. In 1778 he was elected President of Congress, in 1780 went on a mission to Spain, and in the following year was appointed one of the commissioners to negotiate the treaty with Great Britain. On his return to America he became Foreign Secretary, and in 1789 Chief Justice of the Supreme Court of the United States. He took an important part in framing the American constitution. He incurred much odium in consequence of the treaty of 1794, negotiated by him with Great Britain, but was, notwithstanding, soon after elected Governor of New York, and re-elected in 1798. In 1801 he retired from public life.

Jay, WILLIAM (1769–1853), a Dissenting preacher of some power, was the son of a Wiltshire stone-cutter. Before he was twenty crowds came to hear him preach in Surrey Chapel, London. After a short time at Chippenham and Clifton he became pastor of the Argyle Independent Chapel at Bath, where he remained for the rest of his life, and was highly esteemed as a preacher. He married for the second time at the age of seventy-seven. He published twelve volumes of devotional works.

Jean de Vienne, French naval hero, was born in 1341, and in 1373 became a sea-commander. In the same year he was appointed Admiral of France, and at once set to work to create a French navy. In 1377 he landed and occupied Rye, and took and plundered Lewes. Later in the same year he sacked Yarmouth in the Isle of Wight, Poole, and Hastings. In 1385 he made an expedition to Scotland. He fell in action while co-operating with English allies at Nicopolis in 1396.

Jebb, RICHARD CLAVERHOUSE, was born at Dundee in 1841. He went to school at Dublin and afterwards at Charterhouse, and was senior classic at Cambridge in 1862. He soon became fellow of Trinity, and in 1869 was appointed public orator. In 1875 he became professor of Greek at Glasgow University, and in 1889 he succeeded Dr. Kennedy in the same chair at Cambridge. His chief works are editions of the Attic orators (1876) and of the plays of Sophocles (1883), a life of Bentley ("English Men of Letters"), and *Modern Greece* (1880). He became M.P. for Cambridge University in 1890.

Jeejeebhoy, SIR JAMSETJEE, BART. (1783–1859), the Parsee philanthropist, was born at Bombay. As a merchant's clerk he made several voyages to China, in one of which, during the French War, he was captured and sent to the Cape. After his return in 1807 he gradually accumulated by trading a large fortune. This he used to pay

the debts of the Bombay prisoners in 1822, to relieve the sufferers from the Surat fires and rebuild houses there in 1824 and 1837, to provide endowments for the Parsee worship in Bombay and Poonah, and to found the hospital there (1843) which bears his name. He also gave large sums for other purposes subsequently, and in recognition of his munificence was created a baronet in 1857, having some years before been knighted.

Jefferies, RICHARD (1848-87), the popular naturalist, was educated at Swindon, Wiltshire, and at Sydenham. His first novel was published in 1874, but was not successful; but he soon began to contribute to newspapers and magazines, and in 1876 came to London. Next year the publication of his *Gamekeeper at Home*, which had appeared in instalments in the *Pall Mall Gazette*, increased the reputation he had begun to found by a letter to the *Times* on the condition of the agricultural labourer. In 1879 appeared *Wild Life in a Southern County*, which was followed by several similar works. His two best novels were *Beris* (1882) and *Wood Magic* (1881). He suffered from a painful illness in his later years, and was reduced to great poverty.

Jefferson, JOSEPH, an American comedian, was born at Philadelphia in 1829. He appeared successfully in 1848 in *The Maid and the Magpie*, and in 1857 in *The Sea of Ice*, but his first great hit was in *Our American Cousin*, in which he played Asa Trenchard to Sothorn's Dundreary. In 1862 he came to England, and reached the height of his reputation by his impersonation of Rip Van Winkle at the Adelphi. He again visited London in 1874-77, and played his famous part; he also took Bob Acres in *The Rivals*.

Jefferson, THOMAS (1743-1826), third President of the United States, was born at Shadwell, Virginia, his father being a large farmer of liberal tastes and great physical powers. Jefferson was admitted to the Virginian Bar in 1767, and practised for eight years with success. In 1769 he became a member of the Virginia Assembly, and in 1774 prepared the draft of instructions to the Virginia delegates at the Philadelphia Congress, which was amended by Burke and circulated in England. In 1775 he became a member of the Virginian committee of thirteen for raising the colony against the British, and the same year took part in the Philadelphia Congress. Jefferson was chairman of the committee which drew up the Declaration of Independence, but resigned his seat very soon after in order to reorganise the institutions of his native colony on the New England model. He refused the appointment of joint-representative of the United States at Paris in order to devote himself to this work. He carried a Bill abolishing primogeniture, and caused the removal of the capital of Virginia to Richmond. The "Act for Establishing Religious Freedom" was also mainly due to him. From 1779 to 1781 he was Gouverneur of Virginia, and did his utmost to support Washington and to defend the state. After this he was elected by Congress a

plenipotentiary to France, but the preliminaries of peace had been signed before he sailed. As chairman of the Currency Committee in Congress, Jefferson, with Governor Morris, brought into use the decimal system of coinage. In 1784 he was sent to France to assist Franklin and Adams in negotiating commercial treaties, and next year became sole plenipotentiary. During his residence in France he published his *Notes on Virginia*. In the year of the French Revolution he returned to America, and was immediately appointed Secretary of State by Washington. He then became the head of the Republican party in the United States. He resigned in 1794, refused to resume office later the same year, and was a candidate for the Presidency in 1796. Having been Vice-President under Adams, he obtained the highest office in 1800, and being re-elected at the end of his first term, held office till 1809. He retained Federalists in office, contrary to the expectations of his friends. His first term of office was marked by the purchase of Louisiana, and during his second he endeavoured to protect America as a neutral power in the contest between France and England by the embargo of 1807. Jefferson's remaining years were devoted to the organisation of public education in Virginia. His *Manual of Parliamentary Practice* was republished so recently as 1871, and is still much in use.

Jeffrey, FRANCIS (1773-1850), the Whig critic and reviewer, was a native of Edinburgh. He was educated at the High School there, and at Glasgow University. He was also for a short time at Queen's College, Oxford, but left it in disgust. On his return to Scotland he became a member of the celebrated Speculative Society, studied law, and was called to the Bar in 1794. His Whig principles prevented his obtaining much practice in Scotland, and in 1798 he tried to obtain a literary opening in London. He then returned to Edinburgh, and in 1801 married. He had previously published essays, and he saw much literary society, being intimate with Sydney Smith, Brougham, and Horner. With their co-operation he in 1802 established the *Edinburgh Review*, of which he soon became sole editor. It was very successful. Scott contributed to it in its first years, but left it as it grew more decidedly Whig. Jeffrey had a share in the Cevallos article (No. 26), but, as a rule, wrote few political articles. He distrusted the Radical wing of the Whig party. In 1806 he had to meet Thomas Moore at Chalk Farm on account of an article in the *Edinburgh* reflecting on Moore's *Epistles and Odes*, but the combatants were arrested and bound over to keep the peace before anything had taken place. They were fast friends ever after. His personal popularity now gave Jeffrey a good practice, and he was an effective advocate. In 1812 he went to America, where he married as his second wife a relative of John Wilkes. He took a rather active part in politics during the following years, but in spite of this was elected in 1829 Dean of the Faculty of Advocates. The same year he retired from his editorial chair. In 1830 he was appointed Lord

Advocate and soon after entered Parliament. He carried through the Scottish Reform Bill, but he soon became tired of politics, and in 1834 became a judge (Lord) of the Court of Sessions. He criticised Wordsworth, Scott, Byron, Shelley, and Coleridge with great severity, but was never abusive. Four volumes of his *Contributions to the "Edinburgh Review"* appeared between 1844 and 1853.

Jeffreys, GEORGE, LORD (1648-89), the infamous judge, was a native of Acton, near Wrexham. He was educated at St. Paul's School, at Westminster, under Dr. Busby, and at Trinity College, Cambridge. He afterwards entered at the Inner Temple, and was called to the Bar in 1668. He had a large practice at the Old Bailey and Middlesex sessions, his weakness in law being atoned for by his strength in cross-examination. In 1671 he became Common Serjeant, and six years later was made Solicitor-General to the Duke of York, and was also knighted. In 1678 he became Recorder of the City. His proceedings with regard to those accused of complicity in the "Popish Plot" are notorious. His conduct as Chief Justice of Chester and as counsel for the Crown was animadverted upon in Parliament, and though the king refused to remove him from his preferments, Jeffreys was reprimanded on his knees by the House in 1680, and resigned the Recorder-ship. Notwithstanding, next year he continued to act as Crown counsel, and was created a baronet. He was useful to the Crown in the matter of the remodelling of the Corporation charters; took a leading part in the prosecution of Lord Russell (q.v.), and in 1683, in spite of the low opinion held of him by Charles II., was created Lord Chief Justice. He presided at the trial of Algernon Sidney (q.v.), and conducted it with extreme unfairness; and in 1684 illegally refused the claim of Sir Thomas Armstrong, who had been outlawed, to a trial. Charles II. treated him with much favour, and his successor acted upon his advice in having the customs collected without parliamentary grant. In May, 1685, Jeffreys tried and sentenced Titus Oates, and in the same month was created a baron. His next victim was Richard Baxter. After the battle of Sedgemoor the Lord Chief Justice attained the height of his infamy by his conduct of the Bloody Assize in the western circuit. After this James II. made him Lord Chancellor (September, 1685). As such he defended the Dispensing Power, and was appointed President of the High Commission Court revived by his advice. He then directed the arbitrary proceedings against the universities, and it was by his counsel that the bishops were prosecuted. He had several times previously, however, endeavoured to "hedge," and he was compelled to annul several of the proceedings he had instituted. On December 8, 1688, he surrendered the great seal to James, and a day or two after tried to escape from England disguised as a sailor. He was, however, arrested in a tavern on December 12, and committed to the Tower. He petitioned for a pardon from William III., but died in prison.

Jehovah, an utterable variation of the unutterable JAHVEH, the Hebrew name for the Supreme Being, formed by combining *Jahveh* with *Adonay*, "The Lord." Both *Jehōvāh* and *Jahveh* are called the *tetragrámmaton* or "four-lettered name," vowels not being counted as letters in the Hebrew writing. The name is thought to mean "the eternal" or "the unchangeable." The distinctions between the use of the terms Jehovah and Elohim in the Pentateuch have been the subject of much controversy in recent times. The former seems to have connoted the deity as ruler, preserver, and object of worship; the latter the absolute, unknowable deity and author of being. In short, Jehovah was the God of Israel.

Jejunum, that portion of the small intestine intermediate between the duodenum and ileum. [DIGESTION.]

Jelf, RICHARD WILLIAM (1798-1871), a learned theologian, was the second son of Sir James Jelf. He took orders in 1821, was for thirteen years preceptor to Prince George of Cumberland, afterwards King of Hanover, and in 1830 became Canon of Christchurch. During the Tractarian controversy he preached a sermon entitled "Via Media" (1842), which described his attitude. In 1844, when he was Bampton Lecturer, he was appointed Principal of King's College, London, a post which he held till 1868. By his influence Maurice was deprived of his professorship. Jelf published several lectures and sermons, and an edition of Jewel's works.

Jelf, WILLIAM EDWARD (1811-75), a younger brother of Richard Jelf, distinguished himself at Oxford as a classical scholar. His most important work was his Greek Grammar (1842-5), which went through five editions. He was vicar of Carleton, Yorkshire, from 1849 to 1854, afterwards officiated at Caerleon, near Barmouth, and died at Hastings. He was Bampton Lecturer in 1857, and engaged in much controversy with the ritualists.

Jellyfish, a general name popularly applied to a large number of aquatic animals, of which the body is composed of jelly-like substance. The animals included under this term may be grouped into two sets; one may be regarded as pseudo-jellyfish, in which would be included such animals as the minute *Noctiluca*, or the phosphorescent animalcule, which is a Protozoan, and the *Beroida*, which belong to the Ctenophora. The other group, or true jellyfish, consists of various types of Hydrozoa (q.v.): it is to this series that the name ought properly to be applied. But even here the jellyfish belong to many different orders and represent very different stages of development. Thus one group are the free-swimming sexual stage of fixed colonies. Thus, in the zoophyte known as *Campanularia*, the gonophore containing the sexual organs is detached as a small free-swimming medusa or jellyfish. These are, therefore, not to be regarded as individuals, but only as organs separated from the parent colony. The next group have fundamentally the same structure, and were, therefore, grouped with these as the Gymnophthalmata

or naked-eyed medusæ; in this case they are, however, not organs, but true individuals, as they give rise directly to jellyfish exactly like themselves. Such is the case with the *Æginidæ* and *Trachynemidæ*. Two parallel groups occur in the Steganophthalmata or covered-eyed jellyfish; thus in one, as *e.g.* in the common *Aurelia*, the jellyfish is the free-swimming sexual stage of a non-sexual fixed Hydroid; with the other they are produced directly from forms which are either not fixed or but rarely so. All the jellyfish with two exceptions are marine; one of these is the famous *Limnocoelum*, which suddenly appeared in the *Victoria regia* tank at Kew, and the other inhabits Lake Tanganyika. As might be expected with such delicate, soft-bodied animals, they are extremely rare as fossils, but some well-preserved specimens of both *Æginidæ* and *Æquoridæ* occur in the Solenhofen slate.

Jena, a town in the Apolda department of Germany and the grand-duchy of Saxe-Weimar-Eisenach, is pleasantly situated at the junction of the Leutra and the Saale, 56 miles by rail S.W. of Leipsic. It was in existence before 1029, and in the 15th century was acquired by the Electors of Saxony from the Margraves of Meissen, becoming incorporated with Weimar in 1741. The old church of St. Michael has a tower 318 feet high. In the castle (1620) Goethe wrote his *Hermann und Dorothea*. On the Hausberg stands the Fuchsturm, a building regarded with superstitious terror. But the university, founded in 1558, is the chief object of interest. Here Fichte, Schelling, Hegel, Schlegel, and Schiller lectured, and the institution has always been associated with the cause of religious and political freedom. Jena has few manufactures save cigars, pianos, beer, and sausages, but there is some printing and publishing carried on, and the district grows wine and timber. The battle of Jena was fought between Napoleon and the Prussians in 1806, and resulted in the crushing defeat of the latter.

"Jenkins's Ear." In 1738 Jenkins, the master of a trading sloop from Jamaica, declared that he had been boarded by a Spanish revenue vessel, and barbarously deprived of one ear. It is doubtful whether he had not really lost the ear at the pillory; but the story served its turn, and so aroused public feeling in England that war with Spain followed in 1739.

Jenner, EDWARD, was born in 1749. Adopting the medical profession, he became a pupil of John Hunter. He had, when a youth, been impressed with an idea that small-pox and cow-pox were related in such a way that an attack of the one afforded immunity from the other. His serious investigations began in 1775, and were conducted with extreme caution; nor was it until 1798, after he had inoculated a patient with vaccine matter, and found his constitution proof against inoculations with variolous matter, that he ventured to publish his conclusions. The discovery was met by opponents, who denounced it as useless. However, the medical profession at home and abroad, the Court, and the public soon recognised Jenner's merits, and the result in this country was a decrease in the

annual deaths from small-pox to 622 in 1804, the previous average having been 2,018. Jenner spent his later years entirely at Berkeley, where he died very suddenly in 1823.

Jephtha ("the Opener") was driven from his home by his brethren, and settled in Tob, a district of Syria. When close pressed by the Ammonites, his tribe recalled him, and he delivered them from their foes. He made a rash vow that he would sacrifice whatsoever first came out of his house to meet him on his return from battle, and this happened to be his own child. It is to be noted that the passage in Judges (x. 15—xii. 7) does not indicate that the girl was actually killed, but rather suggests that she was condemned to perpetual virginity. Jephtha died after a reign of six years.

Jerba, or GERBA (Anc. Meninx), an island in the Mediterranean, lying close to the coast of Tunis on the S. side of the Gulf of Gabes. It is 22 miles in length from E. to W., and 14 miles in breadth, and is thickly populated. Shawls and woollen goods are manufactured, and many cattle are reared. Besides a triumphal arch of Antoninus, the island contains a curious pyramid of Spanish skulls, erected to commemorate the defeat of Medina Cœli and Andrea Doria by the Turks in 1558.

Jerboa, any rodent of the genus *Dipus*, ranging from South-East Europe and North Africa to China. They are distinguished by the extraordinary length of the three-toed hind limbs, and their mode of progression is a series of jumps so rapid that they seem to skim over the surface like a bird. The Common Jerboa (*D. ægyptius*) is about 6 inches



JERBOA (*Dipus ægyptius*).

long, with a tufted tail of 9 inches. Like most desert animals they are greyish in colour. The Gerbilles, with five digits on all the limbs, are allied, and have a nearly similar range. America has a kindred form, *Zapus hudsonius*, the sole species of the genus, about 8 inches long, the tail counting for five. All live socially in burrows, and hoard grain for food in the winter.

Jeremiah must have been born about the middle of the 7th century B.C. His gift of prophecy was manifested early. His gloomy predictions were resented by Jehoiakim, and he narrowly escaped capital punishment. Jeremiah is believed to have been stoned to death at Taphins about 580 B.C. There can be little doubt that his Prophecies and Lamentations have come down to us in a somewhat "edited" form.

Jericho ("Fragrant," or "City of the Moon") was the first place captured by the Israelites on the west side of Jordan, where it stood near the north end of the Dead Sea, 15 miles from Jerusalem, one of the approaches to which it entirely commanded. The original city was destroyed, and was not rebuilt until the time of Ahab, when the site was perhaps shifted. It still occupied part of the fertile and flowery valley from which it derived its appellation of "the city of palm trees." After suffering severely during the Babylonian Captivity, Jericho experienced a period of renewed prosperity, and was given by Antony to Cleopatra, from whom it passed to Herod the Great. His reconstructed city perished in its turn with the fall of Jerusalem, and another settlement sprang up, the ruins of which are marked by the squalid village of Riha, two miles from the Tell or Spring of the Sultan. For many years this was the seat of a bishopric, but about the 13th century all traces of former prosperity and cultivation faded away.

Jeroboam, the son of Nebat and Zernah, an Ephraimite widow, was employed by Solomon, against whom he revolted. His schemes were detected, and he fled to Egypt until his master's death, when, recalled by the ten tribes of Israel, he was elected their king. He set up golden calves at Dan and Bethel, and reigned for two and twenty years, being succeeded by his son Nadab.

Jeroboam II. succeeded his father Jehoash as king of Israel more than a century after the death of his namesake, whose evil reputation he emulated, establishing idolatry at most of the places associated with the worship of Jehovah, whilst retaining many ritual observances of the Levitical law. He wrested back from Syria all the provinces lost by his predecessors, and extended his dominions beyond Jordan. After a reign of forty-one years he was succeeded by his son Zachariah.

Jerome, ST., EUSEBIUS SOPHRONIUS HIERONYMUS, was born probably about 340 A.D., his parents being Christians of some wealth. He received a careful education which was completed at Rome, where Pope Liberius baptised him. Returning home with a strong bent towards scholarship, he presently set out on a course of travel. He came back to Aquileia, and there wrote to Innocentius his earliest tractate. A long tour in the East brought him to Antioch, and a severe illness induced him to devote his life henceforth to religion, in pursuance of which object he passed some time as a hermit in the wilds of Chalcis, studying Hebrew and the Scriptures. The Meletian controversy recalled him

to Antioch and ultimately to Constantinople as an opponent of Arianism and a champion of Western orthodoxy. In 382 the Pope Damasus invited him to Rome and set him to supervise the Latin version of the Bible, and he had completed the New Testament, with the *Psalterium Romanum* and *Psalterium Gallicum*, when the death of Damasus in 385 started him once more on a wandering career. His advocacy of the celibate life, especially for women, had provoked hostilities, and accompanied by Paula, Eustochium, and other Roman ladies, he roamed over Asia Minor, Egypt, and Palestine, ultimately settling down at Bethlehem, where four monasteries were built. He now set to work upon the translation of the Old Testament with the help of several Rabbis, and he produced what afterwards served as the basis of the Vulgate. His more peaceful labours included lives of Malchus, Pachomius, and Theodoricus, Eastern recluses; *De Viris Illustribus*, a biographical history of the Church, and Commentaries on the Prophets, St. Matthew's Gospel, and the Epistles of St. Paul. The Pelagian heresy aroused once more all his polemical ardour, and his *Dialogi contra Pelagianos* provoked such ill-feeling that he had to fly from Bethlehem for two years, returning in broken health and dying in 420.

Jerome of Prague was born in the city associated with his name about 1365. He studied at the university there, and then went to Oxford, where he imbibed the principles of Wycliffe. He next visited Paris, Heidelberg, and Cologne, and returning to Prague about 1407 with a reputation for learning, he took the side of Huss in the disputes which led to the secession of the German "nations" from the university, and was invited to assist in organising the new university of Cracow. His open profession of Wycliffe's doctrine and his denunciation of the abuses of the Church brought him into such disfavour that he had to take refuge for a time at Vienna, whence he returned to act again with Huss until the latter was expelled and imprisoned at Constance in 1415. Jerome immediately proceeded to the aid of his friend, but found matters so discouraging that he was on his way back to Bohemia when the Duke of Bavaria caused his arrest. Carried to Constance and closely imprisoned, he abjured the principles for which Huss had already forfeited his life. But in May, 1416, he firmly withdrew the confession previously extorted from him. He was forthwith condemned to the stake and died with the utmost courage.

Jerrold, DOUGLAS WILLIAM, the son of a provincial actor, was born in London in 1803. His childhood was spent at Sheerness amidst the excitement of naval preparations for war, and in 1813 he joined the service as midshipman, but retired at the peace of 1815. In 1821 his first comedy, *More Frightened than Hurt*, was accepted at Sadler's Wells, and he presently got employment as dramatist to the Coburg Theatre, and married in 1824. *Black-Eyed Susan* was produced at the "Surrey" in 1829. Meanwhile Jerrold's pen was always busy in the periodicals, his aim being to effect social reforms by the use of unsparing but not unkindly satire.

Most readers will, however, connect Jerrold's fame with his contributions to *Punch*, and amongst these *Mrs. Caudle's Curtain Lectures* stand first, the *Story of a Feather* coming next. In contemporary society he was celebrated for readiness of wit and keenness of repartee, qualities of which it is difficult to preserve any written record. Jerrold died at Kilburn Priory in 1857, leaving a son, WILLIAM BLANCHARD JERROLD, who inherited some of his talent, and held a prominent position as a journalist until 1884, when he, too, passed away.

Jersey, the largest member of the group known as the Channel Islands, lies to the W. of the French peninsula of Cotentin, at a distance of 16 miles from the nearest point of the coast and of 95 miles from Weymouth. It is 30 miles S.E. of Guernsey. The length from E. to W. is 12 miles, and the breadth $5\frac{1}{2}$ miles, the superficial area being 49 square miles. The N. coast is bold, high, and rocky, and offers few safe harbours; but the table-land trends to the S., where the sea-level is reached and the outline deeply indented by the bays of St. Brelade, St. Aubin, St. Clement, and Grouville, that of St. Catherine, facing E., also offering some degree of shelter. The approaches, however, on all sides are beset with dangerous rocks and banks, of which the Corbière, the Dirouilles, the Ecrehous, and the Minquières are the most conspicuous. Geologically, the base of the island is syenite, with overlying masses of quartzite, metamorphous sandstone, porphyry, trap and other igneous rocks, interspersed with occasional beds of shale and china-clay. Topping these in many parts is a layer of deep and rich loam, which, under the influence of a genial climate, is highly productive. Cattle-rearing is, however, more profitable than agriculture, the Jersey cows being famous for their milk; and at present potatoes and tomatoes are the only vegetable products that find favour, fruit being little cultivated. The land is mostly in the hands of peasant-proprietors, owing to the prevalence of the French system of subdivided inheritance, and the population generally is thrifty and prosperous. Fishing affords a livelihood to many inhabitants, and lobsters are exported in considerable quantities. The name of the island is a corruption of *Cæsarea*, and traces of Roman occupation are not lacking, whilst cromlechs attest the existence of an originally Keltic race. St. Maglorins introduced Christianity in the 6th century, and in 916 the island was ceded by Charles the Simple to Rollo of Normandy. It practically became united with the Crown of England at the Conquest, and in spite of many endeavours to recover it, the latest being foiled by Major Pierson in 1781, possession has been held continuously by England since the time of Henry I. It is governed by the "States," an assemblage consisting of a bailiff or judge with twelve jurats of the Royal Court—the first being a nominee of the Crown, the others elected for life by the ratepayers—of the rectors of the twelve parishes, of twelve constables and fourteen deputies elected for three years. A Lieutenant-Governor sent from England controls the executive, and has power to join in the deliberations of the States, but has no vote, though he has

the exercise of a veto. The militia, too, consisting of every man between seventeen and sixty-five, is under his control. The only town of importance is St. Heliers on St. Aubin's Bay, which is the administrative centre. It has an inner and an outer harbour protected by fortifications, and it contains, besides the official buildings, a church dating from 1341, Victoria College, and a large Jesuit seminary. On the rocks in front stands Elizabeth Castle, built in the reign of that queen upon the site of an ancient abbey. Montorgueil Castle and St. Brelade's Church (1111) are also structures of much interest.

Jerusalem (Hebrew YERUSHALAYIM or YER-USHALEM, signifying probably "abode of peace," Greek HIEROSOLYMA late Latin ÆLIA CAPITOLINA), the capital of Judea, and the central point of Hebrew worship and Christian tradition; was founded by the ancient Canaanite inhabitants upon a spur of the limestone ridge that forms the watershed of this part of Syria. Standing at an elevation of 2,600 feet upon a plateau about half a mile square, and cut off by the deep valleys of Gihon W., Hinnon S., and Jehoshaphat E., the city held an almost impregnable position, and was only wrested from the Jebusites by David, who made it the base of his military and political enterprises. The area above indicated included four distinct elevations, now scarcely perceptible, viz., Mount Zion to the extreme S.W., Mount Moriah to the S.E., Acra to the N.W., and Bezetha to the N.E. It is probable that David's city lay between the first two, where now the Jewish quarter exists, his palace being on the slope leading to the pool of Siloam. On Mount Moriah Solomon built his famous temple, where a rectangular walled space called the Haram at present encloses the Mosque of Omar and the El Aksa Mosque, once, perhaps, a Christian church. Recent explorers believe that they have found traces of Solomon's masonry here, and the foundations of the existing walls are more safely identified with those of the sacred building as reconstructed by Hadrian. A valley with a depth of 100 to 150 feet, called the Tyropœon, divided Mount Moriah from Acra, and was spanned by a bridge. On the brow of this latter hill is the striking Byzantine church of the Holy Sepulchre, built in the 4th century by the Empress Helena to distinguish the grave in which Christ lay, and to indicate the scene of His crucifixion and resurrection. There can be little doubt that her identification of these sacred spots rests upon no conclusive evidence, but the claims of other localities present difficulties which it is impossible to discuss within the limits of this article. North of the Haram is a huge rocky platform, where the Seraiyak, or residence of the Turkish governor, marks the site of the Antonia Tower, and the Court of Pontius Pilate. Hence across a deep fosse the height of Bezetha is seen, beyond which lay the caves of the kings, and the place of stoning. Though Mount Zion and Jerusalem are used in the Scriptures as bearing the same signification, this hill appears in early times to have merely been the seat of an outlying fortress, nor was it until the Hasmonean dynasty

that the royal residence, afterwards so enlarged and adorned by Herod, was established here. The palace of Solomon, of stone and wood, probably occupied a position somewhat north of that of David, in the space between Mount Moriah and Zion, known as Ophel. Of the more ancient walls and fortifications, little is known for certain. The eastern limit of the Haram enclosure contains traces of early work. At the date of the siege by Titus there were two older bulwarks, one running

and again destroyed by the Greeks to be renewed by Jonathan. Then the siege by Pompey (65 B.C.) caused havoc which was repaired by Antipater, and at the time of Christ the city had attained its extreme dimensions, including the vast structures of Herod on Mount Zion and its flanks, with the suburb of Bezetha to the N.E.; but in spite of the full details given by Josephus, we have no accurate knowledge of the state of the Acra or N.W. height, to which tradition assigns the position of Golgotha.



JERUSALEM, FROM THE MOUNT OF OLIVES.

west from the West Gate of the Temple to the Tower of Hippicus, and a second starting from the north-west corner of the Temple enclosure and ending with a semicircular sweep at a point near the other. A third wall, begun by Agrippa I., embraced the whole districts of Bezetha and Acra in its extensive circuit. Jerusalem, like Rome, was the object of much exaggeration on the part of patriotic chroniclers, but Solomon, without doubt, left the city in a state of some splendour, much of which was swept away by the invasion of Shishak, and later on Jehoash levelled the walls in part. The fall of Samaria brought prosperity to her rival, and in the time of the later kings Jerusalem had extended its suburbs a good way from the Temple hill. Nehemiah, describing the fortifications as restored by himself about 445 B.C., does not clearly define the circumscribed area, but his circumvallation from the Fountain Gate opposite Siloam to the Valley Gate (now Jaffa Gate) on the west most likely followed the valley of the Tyropœon. After the return from the captivity no great increase ensued for some years. Indeed, Ptolemy I. rased the fortifications in 320 B.C., nor were they restored by the high priest Simon until 200 B.C. Thirty years later Antiochus Epiphanes again swept them away, but they were rebuilt by Judas Maccabæus,

The assaults of Titus brought about the final destruction of the Temple, and of the most ancient quarter as far as the Pool of Siloam. Hadrian apparently purposed to restore the Temple and make the city a Jewish capital, but after the revolution he was content with making Ælia Capitolina a mere pagan centre. The next important period of revival was on the discovery of the Holy Sepulchre, under Constantine (336), when the magnificent church of the Anastasis was erected. Thirty years later, in Julian's reign, another vain attempt was made to renew the glory of the Temple. Eudocia, who ended her life here, founded the church of St. Stephen, and Justinian that of St. Mary. Chosroes took the city in 614, and in 637 it fell into the hands of the Caliph Omar, who began the Mosque of El Aksa, completed about 691 by Abd-El-Malik, the site having been identified with the spot visited by Mahomet in his miraculous journey from Mecca. Saladin (1192) fortified the place, but the modern walls were the creation of Soliman the Magnificent. They enclose about 210 acres and are pierced by eight gates corresponding in the main with the older ones. The division of the city into four quarters, Christian, Armenian, Jewish, and Moslem, is not very strictly observed. Churches and monasteries with schools and charitable

institutions are very numerous ; the Greek Orthodox sect predominates over all other Christian settlers. but the Jewish population, yearly increasing, is larger than all the remaining elements put together. Interesting modern establishments are the Rothschild Hospital and the Almshouses founded by Sir Moses Montefiore. Jerusalem is the Turkish capital of Southern Palestine, being included in the Vilayet of Syria. Municipal affairs are conducted by a mixed council under the Governor, and all foreign states are represented by consuls, who exercise considerable power. The climate is fairly good, though liable to extreme changes ; but the water supply, though improved, is far from satisfactory.

Jervis, EARL ST. VINCENT, SIR JOHN, English admiral and the greatest of all naval administrators, was born at Meaford in 1734. At the age of ten he entered the navy, became a lieutenant in 1755, and was made acting captain in 1757. The operations at Quebec won him a commander's commission in 1759, and in 1760 he was posted. In 1784 he was elected M.P. for North Yarmouth, and he became a rear-admiral in 1787, and a vice-admiral in 1793. He thereupon assumed the chief command in the West Indies, where Martinique, St. Lucia, and Guadeloupe were quickly captured. He returned in 1795, and in the same year was made admiral and commander-in-chief in the Mediterranean, where he hoisted his flag, 1796, in the *Victory*. He carried out, with the aid of Nelson, the evacuation of Corsica, assisted the Austrians in the Adriatic, blockaded Leghorn and Genoa, and protected the convoys. But when Spain joined France he was reduced to the necessity of abandoning the Mediterranean, and retired to Lisbon. In 1797 he won a splendid victory which gained him an earldom, a gold chain and medal, and a pension of £3,000 a year. He next blockaded and set Nelson to bombard Cadiz, repressed a serious mutiny in his fleet, and detached Nelson on the mission which ultimately resulted in the victory of the Nile. Lord St. Vincent returned to England in 1799, and in the following year took command of the Channel fleet and was made Lieutenant-General of Marines. But in 1801 he relinquished employment afloat in order to become First Lord of the Admiralty.

Jesse, son of Obed and grandson of Boaz and Ruth, belonged to the tribe of Judah. He had seven sons, the youngest of whom was David, and two daughters, at all events, Zeruah and Abigail.

Jesse, EDWARD, the son of a clergyman, was born at Bewdley, Worcestershire, in 1780. He was fortunate enough to become private secretary to Lord Dartmouth, and thus held a number of public offices until 1830, when he retired on a pension and devoted himself to literature. *Anecdotes of Dogs* (1846) was his first successful book. *Farourite Haunts and Rural Studies* followed in 1847 ; but his most popular works were the annotated editions of Izaak Walton's *Compleat Angler*, and White's *Natural History of Selborne*. He died in 1868.

Jesse, JOHN HENEAGE, son of the above, born 1815, was for many years a Crown official. He

compiled several interesting volumes of semi-historical works in a pleasant gossiping style. Chief among these are *Memoirs of the Court of England during the Reign of the Stuarts*, *Memoirs of the Court of London from 1688 to 1760*, *George Selwyn and his Contemporaries*, *Memoirs of the Pretenders*, and *Richard III*. His death occurred in 1874.

Jest-books is the name given to collections of witty sayings and practical jokes, and to collections of facetiæ gathered from all sources. Of the first class *Tarlton's Jests*, *The witty and entertaining Exploits of George Buchanan*, commonly called *the King's Fool*, *Jests of Seogin*, etc., are specimens ; but very few were authentic or original. *A Hundred Mery Tales* (about 1525) is the oldest English jest-book known, and Taylor's *Wit and Mirth* is one of the few original works. The best known of English collections of facetiæ is *Joe Miller's Jest-book, or the Wit's Vade Mecum* (1739). In the *Stichus* of Plautus the parasite talks of consulting his books of witty sayings, so that jest-books were known in Rome early in the 2nd century B.C., if not in Athens still earlier.

Jesters, COURT, or COURT FOOLS, were persons in the employ of princes and others, who by their real or affected folly furnished amusement for their masters. They were sometimes witty buffoons who were licensed to quiz the courtiers and even their own masters. The first mentioned in English history is William the First's fool, Goles. Amongst other celebrated jesters are Will Somers, the fool of Henry VIII., and Archie Armstrong of Charles I. ; in France, Friboulet of Francis I., and Chicot of Henri III. In the East the most famous was Bahalûl, the fool of the Caliph Haroun al Raschid. They wore a motley dress and a hood, and carried a bauble, to which a distended bladder was frequently attached. The priory and hospital of St. Bartholomew were founded by Rahere, jester to Henry I.

Jesuits, the members of the society of Jesus, a most influential religious order founded by Ignatius Loyola, which was established by a bull of Paul III., 1540. The founder projected a society devoted to self-culture in all that made for religion, to preaching, gratuitous teaching, and missionary labour, and, in virtue of a fourth vow peculiar to them, bound to obey the Pope implicitly. The intense enthusiasm of the founder and the striking applicability of his general ideas to the circumstances of the Catholic Church attracted several adherents of exceptional ability, notably Diego Lainez, the second general ; Francis Xavier, the "Apostle of India ;" Spaniards, and Pierre le Fevre, or Peter Faber, of Savoy. The society rapidly became the most powerful agent in the reaction which checked the spread of Protestantism, and in time restored whole provinces and kingdoms to the Romish Church. Their learning enabled them to carry on with better success the contests in which the old forces of the Papacy had been worsted by the Reformers and the humanists, Salmeron and Bellarmine being their chief controversial writers. Their zeal and capacity for education continually

enlarged the sphere and strengthened the foundations of their influence. Their attention to the exigencies of polite society and their sympathy with the spirit of enlightenment and material progress made them popular with all classes, while the completeness of their organisation developed a marvellous display of well-directed effort, the most distant ramifications of their vast system being actuated by one intelligent will, that of the general in Rome, whose decisions were based on reports regularly transmitted from the provincials, the superiors of professed houses, the rectors of colleges, the masters of novitiate houses, and individual members delegated to any special office or service. Thus the general and his assistants commanded a bureau of almost universal information on ecclesiastical, political, and social matters. The general, though the supreme head of the society, was himself controlled by a monitor, and advised by five assistants or counsellors. The grateful popes allowed the Jesuits immunity from regular monastic rules, so that they might the more easily attain the practical ends at which the order aimed. The complete self-surrender of every member gave the general instruments on which he could place absolute reliance. Secular offices, such as that of provincial and the rectorship or management of a college, were at first in the hands of secular coadjutors, who only took the vow of implicit obedience, by which arrangement the order avoided external friction between the religious and the lay sentiment, while the secular and professed members kept a check on each other. In a very few years from its foundation this remarkable society had established colleges in many kingdoms of Europe, and had scattered missions over heathendom literally from China to Peru. Many of their professed members were confessors of sovereigns, statesmen, and nobles, and everywhere they were the indefatigable champions of the supremacy of the Roman See. Aquaviva, general from 1581 to 1615, deserves special mention for his improvements in the training of the young, which made the schools of the Jesuits popular and famous. In a few years the Jesuits established themselves firmly in several states of Italy, throughout Spain and Portugal, where they gained great influence at both courts. Before 1570 they had assured the Papal ascendancy in Austria, Bavaria, and the Tyrol, and had gained ground against Protestantism in Germany and France. Their success as missionaries was most conspicuous in Spanish America, where they converted and civilised vast numbers of Indians. In Paraguay they organised a hierarchical state, wherein an ideal age of innocence and prosperity was enjoyed until, in 1750, the Portuguese minister Pombal obtained possession of a large portion of the country by exchange with Spain, and, war having in consequence broken out, procured the recall of the Jesuits from Paraguay, and in 1759 the expulsion of the order from Portugal. By the time of their centenary, 1640, when Vitelleschi was general, their numbers had increased to over 13,000, and abuses had begun to deteriorate the character of the order, and the downward career was in Ranke's opinion much accelerated by the admission,

under Vitelleschi, of professed members to the secular offices. The Jesuit MOLINA (d. 1600) had held semi-Pelagian views concerning grace. The JANSENISTS revived the Molinist controversy, 1640, and in 1656 PASCAL in his *Lettres Provinciales* made a violent onslaught on the Jesuits and their system of casuistry, developed by Escobar, Busenbaum, and others, which, according to their opponents, is subversive of the foundations of morality. By the middle of the 17th century the Jesuits' system of instruction had ceased to satisfy the spirit of the age, and was condemned as superficial. Their acquisition of wealth and assiduous engagement in commerce, in defiance of the fundamental principles of the order, raised up hosts of enemies. Owing to the failure of their factory at Martinique, 1743, they were expelled from France in 1763. They were expelled from Spain in 1767, and in 1771 the order was abolished by Clement XIV. It was shrived or repristinated by Pius VII., 1814. The Jesuits now enjoy considerable influence in southern Europe, and have colleges in England, Ireland, the United States, and elsewhere, and missions in many heathen countries. [LA CHAISE, MALAGRIDA, MARIANA, VICENTINES.]

Jesus Christ (Gk. *Iesûs Christos*, the first word being a transliteration of the Hebrew Jehoshua, Jeshua, or Joshua, "Jehovah is salvation," the second with the signification "anointed" expressing the sense of the Hebrew Messiah) was born at Bethlehem, a town of Judæa, towards the end of the reign of Herod the Great. The authorities for the facts of his life are almost entirely biblical, and as in this work criticism would be out of place, a brief summary is here given of these authorities. The date of the event cannot be absolutely fixed, but the best authorities place it early in the 4th year before the commonly accepted Christian Era. Of the annunciation and the conception the only record is preserved in Matthew's Gospel. Warned, according to the biblical narrative, by an angel of the massacre into which Herod's jealous fear was driving him, Joseph, taking Mary and the babe, fled into Egypt, where their stay must have been brief. On their return after Herod's death, they settled with a view to concealment at Nazareth, a distant and despised town of Galilee, of which, however, Joseph and Mary were natives. Here Jesus apparently was brought up to his father's trade of carpenter, "was subject to his parents," and "advanced in wisdom and stature, and in favour with God and man." At the age of twelve he was taken by his parents for the first time to Jerusalem, where occurred the discussion with the doctors in the Temple. For the next eighteen years Christ's career is to us a blank. Luke distinctly states (iii. 23) that Christ's age at the time of his baptism by John the Baptist was thirty, and authorities are generally agreed that his ministry lasted for three years at least, covering three, if not four, passovers. The crucifixion would thus coincide with the Paschal Feast of A.D. 30, and the testimony of John the Baptist must have been given early in the year 27. There is some difficulty, no doubt, in arranging the incidents of the intervening period in strict chrono-

logical succession, but the following may be accepted as a near approach to accuracy:—

First Year. The temptation in the wilderness, lasting forty days, was succeeded by a second visit to Jordan, when John repeated his witness in the hearing of Andrew and John, who forthwith attached themselves to Jesus as his disciples, and were joined soon after by Simon, Andrew's brother—named Cephas or Peter by his new master—Philip, Nathaniel, and others. The little group set off into Galilee, and halted at Cana for the celebration of a marriage-feast, at which the first miracle was performed, Mary being also present. After a brief stay at Capernaum, they journeyed to Jerusalem to keep the Passover, where occurred the cleansing of the Temple and the interview with Nicodemus.

Second Year. Jesus for a third time visited the north-eastern part of Judæa where the Baptist was still preaching, and again received from him full acknowledgment. Within a few weeks John was cast into prison by Herod, and Jesus was on his way through Samaria to Galilee. In the course of this passage occurred the meeting with the Samaritan woman at the well of Jacob, and during a visit to Cana the son of the nobleman at Capernaum was healed from a distance. Christ went up to Jerusalem this year for the feast of Purim, the cure of the paralytic man at the Pool of Bethesda on the Sabbath provoking the resentment of the Pharisees. We next hear of his appearance as an expounder of Isaiah in the synagogue at Nazareth, whence he was driven by the threats of the Jews to fly to Capernaum. Here at his bidding Simon made the miraculous draught of fishes, James and John were added to the list of disciples, a devil was cast out in the synagogue, and Simon's mother-in-law was cured of a fever. In a progress through Galilee Christ cleansed a leper by the touch of his hand, restored the paralytic sufferer, and called Matthew, the tax-gatherer. We now first hear of definite schemes against his life on the part of the Jewish bigots. The next event is the choice and appointment of the twelve apostles, and the sermon on the mount. At its conclusion Christ moved to Capernaum, healing there the centurion's servant, and going on to Nain, where the widow's son was brought to life. Next occurs the episode of the anointing at the house of Simon the Pharisee by the penitent woman. The cure of a deaf and dumb demoniac stimulated the enemies of truth to accuse Jesus of complicity with Beelzebub; and they were severely rebuked. A long series of parables preceded the stormy night voyage across the lake. On the further side, in the country of the Gadarenes, Christ fell in with the man possessed of many devils, who were at their own prayer allowed to enter into and destroy a herd of swine. The party recrossed the lake, and amongst those awaiting their return was the woman with an issue of blood, and Jairus, whose daughter was at the point of death. The tidings of the murder of the Baptist now induced Jesus to move to Bethsaida, where the second Passover was observed amongst his disciples.

Third Year. Almost synchronous with the great festival was the miracle of feeding the five thousand. During the night following, a storm

arose, in the midst of which Christ appeared walking upon the waters. Once more in Capernaum he foreshadowed to his disciples the mystery of the Eucharist. He passed thence to the neighbourhood of Tyre and Sidon, seeking seclusion, but was pursued by a Syrophenician woman with earnest entreaties for her daughter's welfare, and her prayer was answered. In the region of Decapolis a deaf and dumb sufferer was healed, and this attracted numbers of afflicted persons, for whose benefit the feeding of the four thousand ensued. The scene is soon after changed to the opposite coast of Magdala, where the Sadducees sought a sign and received a rebuff. Crossing the lake once more to Bethsaida, Christ restored sight to a blind man by anointing his eyes with clay, and then journeyed to the confines of Cæsarea Philippi. The transfiguration followed. After this we hear of the expulsion of the evil spirit from the lunatic child, on whom the apostles had tried their powers in vain. Capernaum being revisited, Jesus spoke more freely of his approaching death and resurrection, and Peter by his orders took from the lake a fish which held in its mouth money to pay the tax for the Temple. Jesus was then urged by his unbelieving brethren to go up to Jerusalem, and there give proof at the Feast of Tabernacles of his supernatural claims. Though his "hour was not yet come," he set out for the holy city. Christ now openly taught in the Temple, and his discourse on the living water so incensed the Sanhedrim that they resolved on laying hands on him, and this resolve was strengthened by the pardon given to the woman taken in adultery, and by the restoration to sight and the conversion of a man blind from his birth. Jesus, however, retired for a time to some unknown place in Judæa, whence he sent out seventy disciples, two and two, as messengers of the Word. At the Feast of Dedication he was once more in the Temple, and was threatened with stoning, so that he was again constrained to take refuge near Bethany. The grief of Martha and Mary at the death of their brother Lazarus summoned him to Bethany, where the miracle of raising the dead was again performed. The news of this event inspired Caiaphas and the Sanhedrim with the determination to take his life, their designs being for the moment frustrated by his departure to Ephraim. Whilst wandering thence towards Peræa, he fell in with ten lepers, all of whom were made whole. The Passover was now approaching, and Jesus, knowing that his hour was near, set out for the last time to Jerusalem by way of Jericho, healing two blind men on the road. Bethany was reached six days before the feast, and as he sat at meat in the house of Simon the leper, Mary anointed him with spikenard. Christ began now his triumphal entry into Jerusalem, seated in fulfilment of prophecy upon an ass, which two of his disciples by his order had procured at Bethphage. He returned at night to Bethany, and on the following morning again went to the Temple, cursing the barren fig tree by the way. Then occurred the second cleansing of the Temple, where he taught and ministered to the people, spending that night as the previous one at Bethany. The Temple was once more visited on

the morrow, and in the court of women he saw the poor widow bringing her mites to the treasury. On quitting the Temple he prophesied its speedy destruction. Meanwhile the priests and rulers, seeking some means to compass his death, were approached by Judas Iscariot, who covenanted to betray his master for thirty pieces of silver. The time for the celebration of the Passover being now close at hand, Christ sent Peter and John to find and prepare the guest-chamber, himself following from Bethany in the evening, when took place the Last Supper. The meal over, they all went forth to the Mount of Olives as though to return to Bethany. On reaching the Garden of Gethsemane, Christ entered it with Peter, James, and John only. Judas coming into the garden with soldiers, pointed out his master by a kiss. Jesus surrendered himself to his enemies, and when Peter smote off the ear of Malchus with a sword, restored it at once. He was led by his captors before Annas, and whilst he underwent questionings and buffetings, Peter, standing outside among the servants, thrice denied Christ. Jesus was then brought before the Sanhedrim. The court pronounced him guilty of death, and remitted him to Pilate, who alone could give effect to the sentence. Then ensued two interviews with Pilate, first in the public prætorium, afterwards in a private chamber, after which the governor decided to submit the matter to Herod Antipas, who sent him back to Pilate. The latter would gladly have released him, convinced as he was of his innocence, and warned by his wife's dream, but the Jews clamoured for the extreme penalty, and preferred to see mercy extended to Barabbas rather than to Christ. Pilate caused Jesus to be scourged, crowned with thorns, arrayed in a purple robe, and adorned with a reed as a sceptre. The Jews, however, overcame the procurator's final scruples by casting a suspicion on his loyalty to Cæsar. So the judgment was passed, and he was led forth to Golgotha bearing his cross, until Simon of Cyrene was forced to assist him. He was nailed to the cross, a malefactor on either side of him, and the inscription, "This is Jesus the Nazarene, the King of the Jews," fixed above his head. Mary, his mother, stood near with her sister, Mary Magdalene, and the apostle John also stood near and heard his last words. With Pilate's sanction the body of Christ was given to Joseph of Arimathæa, who, aided by Nicodemus, conveyed it that same night to a rock sepulchre hard by. Early next morning the women returned to complete the embalming, and an angel rolling away the stone for them, they found the tomb empty. Peter and John were summoned, and verified the report of the women. Christ's first appearance was to Mary Magdalene a few hours later, and then he was seen by other women. Towards evening he spoke to Cleopas and another disciple on the road to Emmaus, and entered their dwelling. After that he revealed himself to Simon, to the ten when he ate in their presence, to the eleven when the doubts of Thomas were dissipated. Some time later he manifested himself to seven of the apostles, who had now gone back to their fishing on the Sea of Galilee. Again upon a mountain in Galilee he became visible to many, and finally, just before

Pentecost, he joined the company of believers then going up to Jerusalem, and led them to a hill near Bethany, where he "vanished out of their sight."

Jet, a compact lustrous variety of lignite (q.v.) resembling cannel coal, but harder and taking a better polish. It is undoubtedly of organic origin, being generally, if not always, derived from coniferous wood. It burns with a thick smoke. It occurs in isolated masses in the bituminous shales in the zone of *Ammonites serpentinus*, near the base of the Upper Lias at Whitby in Yorkshire, where it was worked by the Romans, and seemingly even in the Bronze age. Its lightness renders it valuable for ornaments, and the tough Whitby jet can be readily carved. Jet is imitated by black glass and by ebonite.

Jetsam (JETSON or JETTISON). By this designation, goods which have been cast into the sea and there sink and remain under water, are distinguished. For the distinction between this and flotsam, see FLOTSAM.

Jevons, WILLIAM STANLEY, F.R.S., the son of a Liverpool merchant and grandson of William Roscoe, was born in 1835, and educated at University College, London. From 1854 to 1859 he was assayer to the Mint at Sydney, and produced a book on the climate of Australia and New Zealand. On returning to England he took up economical science and logic, holding professorships in Owens College, Manchester, from 1866 to 1876, when he was appointed to the chair of political economy in University College, London. As a writer he first drew attention by *The Coal Question*, wherein he predicted the speedy exhaustion of our supply of fuel. His chief other books are entitled *The Principles of Science*, *The Theory of Political Economy*, *Elementary Lessons in Logic*, and *Money and the Mechanism of Exchange*. He was drowned whilst bathing at Bexhill in 1882.

Jewel (or JEWELL), JOHN, Bishop of Salisbury, was born near Ilfracombe, N. Devon, in 1522. He entered Merton College, Oxford, at the age of thirteen, and four years later became tutor at Corpus Christi. Having early embraced Protestant principles, he was expelled under Mary in 1553, when he made a weak recantation, which he afterwards abjured on effecting his escape to Frankfort. Coming home again on the accession of Elizabeth, he was made bishop in 1560, the date of the publication of his famous *Apologia Ecclesiæ Anglicanæ*, a claim on behalf of the Reformed Churches to take part in the Council of Trent. The Queen ordered a copy of the book to be chained beside the Bible in every parish church of England. In 1567 he published his *Defence of the Apology* in reply to Thomas Harding. Jewel boldly assumes the position that the Church of England is based not upon the fathers and tradition, but upon the teaching of Christ and the gospels. He scouted the doctrines attributing supernatural efficacy to the sacraments, and maintained that a consensus of opinion was not a test of truth. He died suddenly at Monkton Farleigh, Wilts, in 1571.

Jewellery, the name given to articles made of precious stones and metals for personal adornment, and to other jewelled specimens of gold- and silver-smiths' work. There are many different kinds, from the beads of early times and of savages to richly-chased ornaments of precious stones cut and set in wrought gold. The earliest worked metal in use was gold, which was hammered into shape. Precious stones used in jewellery include diamonds and gems, such as rubies, sapphires, and cameos of various kinds, and also pearls, jet, and coral. Among the first to master the art of making jewellery were the Egyptians, and in the oldest monuments we find engraved examples enriched with enamel as well as stones, and with the different parts soldered together. The Greeks, Etruscans, and Romans have left us specimens of their work. Now most jewellery is made by machinery. The places where jewellery is chiefly made are London (Clerkenwell), Vienna, Paris, New York, Birmingham (where sham jewellery is made), and Whitby (where jet ornaments are made). In the East the precious stones used are generally uncut. "Prussian jewellery" is of delicate work, made of iron, originally made during the French occupation.

Jews (Mediæval French *Juis*, from Lat. *Judæi*), properly the descendants of יְהוּדָה, Yehûdah, Judah, fourth son of Jacob, but applied generally to the Hebrew people, who since the dispersion of the ten northern tribes have been mainly represented by the tribe of Judah, a remnant of Benjamin and a few Levites—that is, the section of the nation which to the number of some 50,000 returned to South Palestine (Judæa) after the Babylonian captivity. These were doubtless, later, joined by some of the dispersed northern tribes, from remote times distinguished as the "ten tribes of Israel" from Jacob's alternative name; but all such Israelites had lost their separate nationality, and were consequently absorbed in the royal tribe of Judah. Since the destruction of Jerusalem by Titus (A.D. 70), and the suppression of the two last revolts—that of the Cyrenaica Jews by Trajan (115–17), and that of the Palestine Jews under Barcokeba by Adrian (132–35)—the Judæi themselves have been a dispersed nationality, though numerous migrations and settlements had been made in various parts of the Greek and Roman worlds, in Arabia and Abyssinia, centuries before those events. The flourishing Jewish community of Alexandria was established under the first Ptolemy, and from that great centre large colonies had moved westwards to Cyrenaica and Tripolitana, some of whose descendants (the Troglodyte Jews of the limestone cliffs south of Tripoli) survive to the present day. But the great bulk of the scattered people descend from those of the great dispersion after the fall of Jerusalem, increased by numerous accessions from converted "Gentiles," for the assumption that they have made few or no converts is based on ignorance. In exile they have been far more a religious sect than a broken nation, and as such they could not fail under favourable conditions to spread their teachings, not only amongst their Christian slaves, but also amongst peoples of lower culture than themselves.

Apart from the Abyssinian Falashas [FALASHAS], in pre-Mohammedan times many Arab tribes of Yemen and other districts had conformed, and some of their Jewish kings (Asad Abu-Karib, Dhu Nowas, etc.) are still remembered. About the 7th century all the Khazars, a renowned Tatar people of the Volga, the Crimea, and the Caspian, accepted Judaism, though these were afterwards absorbed by the Russian Christians. The terrible persecution of the Spanish Jews under the Visigoth kings (5th and 6th centuries) appears to have been largely due to their proselytising zeal, against which, as well as against Jewish and Christian mixed marriages, numerous decrees of popes and councils were issued during mediæval times. To this process of miscegenation is attributed the great variety of physical features observed amongst the Jews of different countries, while the distinctly red type cropping up almost everywhere has been traced by Sayce and others to primordial interminglings with the Amorites ("Red People"). Dr. Dally, a distinguished French anthropologist, declares that there are all kinds of Jews—brown, white, dark; Jews with black and with blue eyes; tall, short; concluding that, therefore, there is no longer any question of a Jewish race at all. Nevertheless, certain marked characteristics, such as large hooked nose, prominent watery eyes, thick and almost everted under lip, rough, frizzly, lustreless hair, flat feet, are sufficiently general to be regarded as racial traits. According to returns made in various countries between the years 1880–92, the Jewish race, or at least the Jewish sect, numbers at present about 6,500,000, of whom 5,500,000 are in Europe, 250,000 in Asia, 420,000 in Africa, 300,000 in America, and 10,000 in Australasia. In 1891 they were estimated at 93,000 in the British Isles, of whom over 67,000 are in London alone. The race is richly endowed with the most varied qualities, as shown by the whole tenour of their history. Originally pure nomads, they became excellent agriculturists after the settlement of the Promised Land, and since then they have given abundant proof of the highest capacity for poetry, literature, science, erudition of all kinds, music, and diplomacy. The reputation of the mediæval Arabs as restorers of learning is largely due to their wise tolerance of the enlightened Jewish communities in their midst, and on the other hand Spain and Portugal have never recovered from the national loss sustained by the expulsion of the Jews from the Iberian Peninsula in the 14th and 15th centuries.

Jew's-ear, the popular name of a tough gelatinous fungus, *Eridia Auricula-Judæ*, belonging to the Tremellini. It grows principally on the elder, one of the trees on which Judas is said to have hanged himself, and occasionally on elm. It is cup- or ear-shaped, velvety externally and wrinkled within.

Jew's-harp, or JEW'S TRUMP, one of the simplest of musical instruments. It consists of a steel tongue between two parallel bars, to which it is fastened at one end; at the other is a piece at right angles, so that it can easily be struck with the performer's finger. Various sounds can be produced

by the performer altering the shape of the resonator furnished by his mouth and throat. The most celebrated performer was a man named Eulenstein, who played on sixteen Jew's-harps tuned to different keys. He performed in London in 1828, and died 1890.

Jeypore, or JAIPUR, the name of a state and its capital in Rajputana, N.W. India. The former has an area of 14,465 square miles, lying N. of Gwalior and S. of Patiala, having Alwar to the E. and Jodhpur to the W. It consists of an open and tolerably level tract sloping upwards from the Jumna towards the Aravalli range in the N.W., where it forms a triangular plateau and extends into the sandy desert of Shaikhawati. Here vegetation is scanty, but the S.E. districts bear fine crops of cereals, pulses, cotton, sugar, seeds, opium, and tobacco. Irrigation has done much to improve agriculture in the last quarter of a century. Copper and cobalt are found in the mountains, and the Sambhar Lake yields a large supply of salt. The climate is dry and healthy. The government of the state is in the hands of a Maharajah, whose policy is guided by a British resident. The capital is one of the finest and richest of Hindu cities, and stands on the Rajputana State Railway, which runs from Agra to Nasirabad. Founded in 1728, Jeypore occupies a plain defended on all sides except the S. by rugged hills. It has a length of 2 miles, by a breadth of $1\frac{1}{4}$ miles, and the streets are handsomely laid out and lighted with gas. Banking and exchange business constitute the chief sources of prosperity. Among the principal buildings are the Palace, the Residency, the Thakur's College, the Observatory, and many fine mosques and temples.

Jhansi, the name of a division, a district, and city in the north-western provinces of British India. The division has an area of about 5,000 square miles, comprising the greater part of Bundelkhand, and including the three districts of Jaláun, Lalitpur, and Jhansi. The latter, lying between the other two, extends over 1,567 square miles of sloping ground from the Vindhya range on the S. to the Jumna on the N. The upper portion is mountainous and rocky until the rich alluvial plain of Bundelkhand is reached. The Pahuj, Betwa, and Dhasan are the chief rivers. Much of the land is sterile, and much uncultivated; droughts and floods occur frequently; the population is poor and sickly; though the more fertile parts yield in good years plenty of cotton, pulse, cereals, and *al* root for dyeing. The district was not entirely annexed by the British until 1853, and the deposed *rani* proved a troublesome foe during the Mutiny of 1857. She was killed in battle, and under our rule the prosperity of the country has advanced. The city of Jhansi is in the neighbouring state of Gwalior, to which it was transferred with a strip of territory in 1861. It possesses a stone fort built on a lofty rock, and commanding the neighbourhood as well as the new settlement of Jhansi Naoabad, where the headquarters of the Jhansi district are now established.

Jhelum, or JHILAM, a district in the Punjab, British India, lying between Rawal Pindi N., the

Jhelum River E., and the districts of Shahpur and Bannu S. and W. Consisting of 3,910 square miles, mostly taken up by the three ridges of the Salt Range, which trend down from the Himalayas, Jhelum is picturesque but by no means fertile, except along the banks of the river and in the occasional valleys. Here wheat and *bajra* are grown, but the most valuable product is salt. The population is chiefly Mohammedan, and a dynasty of semi-independent princes, established after the Moghul invasion, ruled here until conquered by Rangit Singh, from whom the whole country passed into British hands. Though Jhelum, a small modern town on the river of that name, is the administrative centre, nearly all the trade is carried on at Pind Dadan Khan.

Jib, the foremost ordinary sail of a ship, barque, brig, schooner, or cutter; a large staysail extended from the bowsprit, or bowsprit and jib-boom, towards the foretopmast head, or, in cutters, etc., towards the lower masthead. It is of great command in a sidewind, and especially when the vessel is close-hauled. A flying-jib is a sail occasionally set upon a boom rigged out beyond the jib-boom. A middle-jib is sometimes set between the two already mentioned.

Jiddah, JEDDAH, or DJIDDAH, a town and port of Arabia on the E. coast of the Red Sea, about half-way between Suez and Aden. As the spot at which pilgrims journeying to Mecca by sea have to begin their inland march, it is a busy and prosperous place, spreading, with its white houses, for a mile or more along the beach, and containing a good bazaar, several indifferent mosques, and a network of narrow streets enclosed within a dilapidated wall. The Mecca gate to the E. is surrounded by a large suburb and market. Outside the Medina gate on the N. stands the tomb of Eve and the quarters of the Turkish garrison. The sanitary condition of the town, once appalling, has been somewhat improved of late, but the scarcity of water is a great defect. Jiddah, in the 15th century, was the point at which the traders from the East and the West used to meet, but with the improvement of navigation and the introduction of steam, this state of things passed away. There is, however, still a considerable export of Arab produce—coffee, gums, mother-of-pearl, hides, and embroidered tissues; whilst the merchants of the interior draw their supplies of Western goods from the bazaars. Turkish rule has prevailed continuously, except during the brief career of Mehemet Ali. In 1858 a massacre of the European residents led to the bombardment of the town by an English man-of-war. The distance from Mecca is about 45 miles, and that from Medina about 200 miles.

Jigger, a small flea, common in the West Indies and South America; the female burrows into the skin of animals, including man, and there lays its eggs. The insect itself swells very largely by the growth of the eggs.

Jingo, in the slang phrases "by Jingo," and "by the living Jingo," is supposed by some to be a corrupt form of the Basque word Jainko for Jangoikoa,

"the supreme Lord," said to have come to England *viâ* Wales, whither Edward I. had sent some Basque soldiers. The earliest registered instance of the word occurs in Oldham's *Satyrs upon the Jesuits* (1679). Another explanation is that it is a form of St. Gungulphus. In British politics a "Jingo" was originally an advocate for war with Russia during the Disraeli administration of 1874-1880, the term being taken from a "by Jingo" in a music-hall song, 1878. Now "Jingoism" is British Chauvinism, or an aggressive menacing policy as to foreign affairs.

Jingoism. [JINGO.]

Jinn (the plural of the Arabic *jinn*), in Mohammedan theology, angels created 2,000 years before Adam, but cast out of Paradise because they sinned. Their chief was Iblis (q.v.).

Jintias (*Jaintias*), a wild tribe of north-east India, akin to the Khassias, occupy the eastern section of the uplands separating the Brahmaputra from its great affluent, the Megna. Since the deposition of their chief in 1835, their territory has formed an integral part of the British province of Assam. The Jintias are a brave but peaceful people, who cultivate much land, and keep large herds of cattle.

Joachim, JOSEPH, was born of Jewish parents at Kitsu, near Presburg, Hungary, in 1831. Entering the Musical Conservatory at Vienna as a mere child, he attained such skill as a violinist that he was engaged at the age of twelve in the Gewandhaus Orchestra, Leipzig. Here he remained for seven years studying under F. David and M. Hauptmann. In 1850 he made his first appearance in Paris, and was soon afterwards appointed director of concerts at Weimar, going thence as Kapell-Meister to Hanover in 1853. By this time his reputation had spread over Europe, and he won especial popularity in London, where he has appeared almost annually for the last forty years. He has never allowed his pre-eminent manual control over his instrument to turn him aside from the highest functions of his art as interpreter of the works of great composers. He himself is also a theoretical musician of considerable merit, and has written some excellent concerted pieces in the manner of Schumann. Herr Joachim was, in 1869, called to Berlin as director of instrumental music in the newly-founded Conservatory, and in 1882 was promoted to the directorship of the Berlin Academy of Music. He received, in 1877, the honorary degree of Mus. Doc. from the University of Cambridge.

Joan, a lady of doubtful historical authenticity who, according to mediæval legends, filled the Papal chair as John VII. or VIII., between the pontificates of Leo IV. and Benedict III. She is said to have been of English race, though born in Germany, her Christian name being either Agnes or Gilberta. Love for a Benedictine monk led her to adopt male attire, and join him in the monastery of Fulda. On his death she kept up the disguise, went to Rome, and by her piety and learning so influenced the Cardinals as to secure the tiara by their unanimous vote. Her secret, however, was not so strictly kept

but that she gave birth to a child in a street near the Lateran Palace, which is to this day avoided by Papal processions. The story first crops up in the Chronicle of Stephen de Bourbon, early in the 13th century. Then it was interpolated into the text of Martinus Polus fifty years later, and so became current, until in 1400 a bust of this chimerical personage was placed among those of the other popes in Siena Cathedral. The fiction probably originated in the spite of the Dominicans and Minorites against the Benedictines.

Joan, known as "the Fair Maid of Kent," was the daughter of Edmund, Earl of Kent, brother of Edward II. She married, as the widow of Sir Thomas Holland, her cousin the Black Prince, and bore him a son, afterwards Richard II. She died in 1385.

Joan of Arc, JEANNE D'ARC, or JOANNETA DARC, the Maid of Orleans (Fr. *La Pucelle d'Orléans*), was born about 1411 at Domrémy on the frontier of Lorraine, her father being a small yeoman or peasant proprietor. From her mother, Isabeau, a pious woman who had made her pilgrimage to Rome, she learned the elements of religion and the duties of the house, becoming very expert with the needle, but she could neither read nor write. Overflowing with animal spirits as a child, she grew more reserved and exalted in early womanhood, spending her time in solitude and prayer, repelling the advances of suitors, but not neglecting her duties to her parents and neighbours. In 1428 the Earl of Shrewsbury on behalf of Henry V., whose claim to the French crown was supported by his mother-in-law, Isabella, to the detriment of her own son, Charles the Dauphin, began the siege of Orleans, the capture of which town was necessary before the English could extend their conquests into the south. This event gave an impulse to the girl's highly-wrought and enthusiastic nature. Legends were already current that the wrong done to France by one woman should be effaced by another, and she aspired to become the instrument of heaven for delivering her country. Soon she fancied she heard saintly voices urging her to her task, and no longer deterred by the remonstrances of her kinsfolk, she persuaded the Governor of Vaucouleurs to send her in February, 1429, to the Dauphin's quarters at Chinon. Recognising the prince at once among a crowd of courtiers, she speedily won his confidence, and she was allowed to take five thousand men to the relief of Orleans. Clad in armour, girt with a miraculously-found sword, bearing her holy banner, she rode at the head of the troops, whom her presence inspired with wild enthusiasm. At the end of April she succeeded in penetrating into the city, and ten days later the siege was raised. A series of victories followed, and on July 17th she stood beside the king at his coronation in the cathedral at Rheims. She then urged the feeble-spirited Charles to attempt the recapture of Paris, but the failure of the first onslaught, in which she was wounded, caused him to abandon the expedition, and Joan went off in 1430 to help the Duc d'Alençon. On May 24th, whilst leading a sortie from Compiègne, she was sur-

rounded and captured by the Burgundians. The king made no effort to ransom her, and the Church did all in its power to destroy her. The Bishop of Beauvais procured her sale to the English, who handed her over for trial to the Inquisition. This mockery of justice began on January 9th, 1431, when, being found guilty of heresy and sorcery, she submitted and received a nominal pardon. The English, however, did not release her, but induced her to resume her male attire. She was then charged with repeating her offence, and condemned to death at the stake. She perished with great fortitude in the market-place at Rouen, May 30, 1431. The Church of Rome revoked the sentence twenty-five years later, and proceedings are now going on with a view to her beatification. No character has been more acrimoniously discussed than hers, but it has withstood the unclean sneers of Voltaire, and the almost as offensive attempts to make her life and death a source of glorification to her destroyers.

Joannes, or JUANES, VINCENTE, was born at Valencia, Spain, in 1523 (or 1506). He studied painting in Rome, and may be regarded as the founder of the Valencian School. His works, chiefly religious, adorn the churches of his native town, and several fine examples exist in the galleries of the Madrid Museum. He died in 1579.

Joannes Damascenus, or CHRYSOHOAS, was born at Damascus, about 676, of a distinguished Christian family, and received his education from the Italian monk, Cosmas. He incurred the wrath of Leo III. of Byzantium by vigorously defending image-worship, and is said to have had his right hand struck off through the machinations of his foe. The Virgin, however, restored the lost member, and he spent the rest of his days in the monastery of St. Sabas, near Jerusalem, where he composed his *Fons Scientiæ*, *Vita Barlaam et Josephi*, and his famous hymns, dying at the age of seventy.

Job, the name of the hero of that remarkable literary monument which is preserved in the Hebrew Scriptures under the title of The Book of Job. It is possible that Job may really have existed in the patriarchal age, and that some tradition of his career may have supplied the theme for what is undoubtedly, as we have it, a moral romance and not a historical narrative. As to the value, however, of the few facts recorded, we are less able to form an opinion than upon the exploits of Achilles or Romulus. Nor are we in a much better position to judge as to the authorship of the work or the date of its composition. References that seem to bear upon the Psalms indicate a later origin than the period of Solomon, but in other portions the absence of the name Jehovah or of any suggestion of Mosaic law can hardly be the result of artificial skill. On the other hand, there is a direct mention of Job in Ezekiel, and distinct literary evidence is supplied in Isaiah and Jeremiah. The tone of thought pervading the whole, and the tendency of Hebrew moralists to convey a national as well as a personal lesson in their deliverances, would almost justify

the theory that the Book of Job was cast into its present shape during the period of the Babylonian Captivity. It is probable that the author incorporated with his book pre-existent materials, and it appears certain that interpolations have been introduced at later periods. The work falls naturally into five sections. 1. The prose introduction wherein the author states the facts that lead up to the ethical problem to be solved. (Chaps. i. and ii.) 2. The poetical debate between Job and his three friends is then begun, the famous verses in which he curses his day supplying the keynote. Thrice Job speaks, and on each occasion the comforters reply in turn, except that in the last encounter Zophar remains silent. (Chap. iii.-xxxi.) The main subject discussed is one which is still puzzling mankind, viz., how can we reconcile with the conception of a Divine Providence the fact that the righteous often suffer and the wicked frequently prosper? The Jews, as represented by Job's three visitors, got rid of this awkward difficulty by asserting boldly that all mundane misfortune was a punishment for personal or hereditary sin, and this theory Job passionately confutes. 3. Elihu, the Buzite, who had thus far been a listener only, now comes forward, and reproves all the previous speakers for presuming to set up their judgments against God or to criticise His government of the universe. (Chap. xxxii.-xxxvii.) Whatever He does must be right and good. There is some reason to believe that this argument, which differs little from the speech of God Himself in the following chapters, has been thrust into the poem by a pious imitator. 4. Provoked by Job's challenge, the Deity speaks at last out of the whirlwind, and in more vigorous language than Elihu repeats the crushing doctrine that no being who does not possess God's wisdom and power can presume to cavil at His government. (Chap. xxxviii.-xlii. 6.) Job, abashed, answers: "I have heard of Thee by the hearing of the ear, but now mine eye seeth Thee. Wherefore I abhor myself, and repent in dust and ashes." The problem remains unsolved, but we lose all sense of its importance in the greater mysteries that surround us. 5. The author once more resumes the prose style to mar somewhat the effect of what has gone before by recounting how Job was restored to a prosperity twice as great as that he had enjoyed before, whilst the three friends received a severe rebuke. None of the inspired writings contains grander imagery or appeals more strongly to human sympathies than this product of an unknown mind and an unknown age. It represents, too, that revolt against narrow Semitism which was destined to triumph under the banner of the Cross.

Job's-tears, the fruits of an East Indian grass, *Coix lachryma*, in which the involucre enclosing the female flower and base of the male spike becomes a polished, pearl-grey, oval, stony body, which is often used in rosaries and necklaces.

Jocelin de Brakelonde, the compiler of the well-known chronicle that bears his name, was a Benedictine monk at the Abbey of Bury St. Edmunds, acting as chaplain to Abbot Sampson.

His record of the affairs of the community extends from 1173 to 1202, and is a curious example of the naïf and simple spirit of his age. It suggested to Carlyle the idea upon which he founded the essay entitled *Past and Present*. Jocelin died about 1211.

Jodhpur, known also as Marwar, is a native state of Rajputana, India, lying between Bikaner on the N., Jeypore on the N. and E., the Sirohi and Palanpur States on the S., and the Runn of Kutch and Sind on the W. It has an area of 37,000 square miles, most of which consists of a sandy plain dotted with conical hills that occasionally reach the height of 3,000 feet. The river Luni, rising in the Lake of Pushkar and disappearing in the swamps of Kutch, together with its tributaries, waters part of the soil and allows of the growth of fair crops, but trade is the chief resource of the population, and Marwaris are to be found in business over all India. Over 80 per cent. of the inhabitants are Hindus. Salt derived from the lake of Sambhar, and zinc and marble, which abound in the mountains, yield a considerable revenue. Education prevails more widely than in most native states. The Maharaja, a Rajput, has been since 1839 under the surveillance of the Agent-General for Rajputana, and pays a tribute to the British Government, maintaining also the Erinpura Contingent in addition to his own army of about 10,000 men. Jodhpur, the capital, is built about a rock fort which comprises the palace, a fine structure. Stone being abundant, all the streets present a substantial and handsome appearance, whilst a wall 6 miles in length encloses the whole city. Mandor, the ancient capital, now in ruins, lies 3 miles to the north.

Joel, whose name comes second amongst the minor prophets, is called the son of Pethuel or Bethuel, but neither the contents of his book nor the traditions of the Hebrews throw any light upon the author, whose date even is a matter of uncertainty. Some assign him to the reign of Joash in Judah, others contend that he wrote after the return from Captivity. The plague of locusts which forms the starting-point of his prophecies cannot be identified with any historical event, and may be a mere allegory. He does not refer to any specific power as the oppressor of his country, and his mention of Phœnicians, Philistines, Edomites, and Egyptians does not point to any particular period. On the other hand, it would seem that when he wrote the national life still centred about Zion, where elders and priests assembled without a king, that Israel had ceased to exist, and that the walls of Jerusalem had been rebuilt by Nehemiah. Moreover, if the words, "when I shall bring again the captivity of Judah and Jerusalem," are to be accepted literally, they absolutely fix the date as being after the exile. The style and language of Joel are remarkably pure and clear, but he lacks originality and fire. His book opens with an address to the nation then suffering under a plague of locusts, and an invitation to seek the sole remedy in repentance, fasting, and prayer. Then comes the reply of Jehovah to his humbled worshippers, wherein are recapitulated all the promises of future

prosperity and of revenge on foreign foes that may be read in the other prophets, but none of Messianic import.

Johannisburg, a town in the province of E. Prussia, Germany, 68 miles S.W. of Gumbinnen. It is close to Lake Rosch or Warschau, and is the capital of a circle, having the usual public offices.

Johannisburg, or JOHANNESBURG, the chief commercial town of the Transvaal or South Africa Republic, was founded in 1887, its name being derived from a native chief whose subjection involved some trouble. It is situated a few miles S. of the capital, Pretoria, in a barren and dusty plain, but owing to the proximity of the gold-fields and the energy of British immigrants, the development of the place has been marvellously rapid, and it is believed now to contain a population of 80,000, half of whom are whites. The streets are well laid out, the buildings handsome, and the sanitary arrangements and comforts of life fairly good, considering the scarcity of water and the great distance over which everything has to be brought by traction. Railway communication has now, however, been opened up with Cape Town, nearly 1,000 miles away, and there seems a prospect of lines from other settlements converging at this point.

John, St., Apostle and Evangelist, the son of Zebedee and Salome, was following his father's occupation as a fisherman, when the fame of John the Baptist attracted him to Bethany, where he met Jesus. He became known as "the disciple whom Jesus loved." After the Resurrection he remained in Jerusalem, and was there at the time of Paul's second visit. Tradition asserts that he was settled at Ephesus up to the time of Trajan, and having been immersed with impunity in boiling oil was banished to Patmos, where he wrote the Apocalypse, and died at a very great age from natural causes.

John, St., "THE BAPTIST," the son of Zachariah, a priest, and Elizabeth, kinswoman of Mary, the mother of Jesus, was born in Judah six months before the birth of Christ. We hear little of his subsequent life, save that in his thirtieth year he began to preach in the wilderness east of Jerusalem and to "baptize" in Jordan. To this baptism Jesus himself submitted, and was at once acknowledged as a superior. John ended his ministry by imprisonment and decapitation in the prison of Machærus, his doom having been brought about by his denunciation of the marriage of Herod Antipas with Herodias, his brother's wife.

John, THE EVE OF ST., a Christian festival celebrated during the middle ages on June 23. Fires were lit in the streets, and the younger members of the populace leaped over the flames amidst songs and dancing. Many superstitions have sprung up, the Irish thinking that all souls visited their death-place on this night, and the English that if anyone sat in a church porch all night he would see the souls of all those of that parish about to die in the following year come and knock at the door.

John, GOSPEL OF ST., the last of the four canonical gospels, the authorship of which is attributed to the apostle John by many of the early fathers, including Theophilus of Antioch, Irenæus, etc., the latter thinking that he also wrote the Apocalypse and Epistles. It is supposed to have been written at Ephesus in Asia, according to Irenæus, against the doctrine of Cerinthus, and this probably is the reason for the number of explanatory remarks on Jewish facts and customs. St. John is different from the rest, in laying the principal scenes of Christ's life in Judæa, and also because many events and sayings chronicled in the synoptic Gospels, such as the sermon on the mount and the agony in the garden, are left out and new persons and places are introduced.

John, SANSTERRE or LACKLAND, the youngest son of Henry II. and Eleanor of Aquitaine, was born in 1167, and destined by his father to found the kingdom of Ireland. He went to that country in 1185, but his unbearable temper caused his speedy recall. He then joined Richard in the revolt which proved a death-blow to the king, and was rewarded but distrusted by his brother with good cause. During the absence of the latter in the Holy Land he acquired a sort of titular authority in England, and allied himself with Philip Augustus of France, Richard's bitter foe. Richard, however, named him as his heir on his death-bed, ignoring the hereditary claim of Arthur of Brittany, whom Philip forthwith supported. John divorced his first wife and married Isabella of Angoulême, betrothed already to the Count of La Marche. In the war that ensued, though Arthur vanished mysteriously from the scene, all the English possessions in western France were lost. John's next trouble was with the Pope (Innocent III.), whose nominee for the Archbishopric of Canterbury, Stephen Langton, the king refused to accept until placed under an interdict and threatened with invasion by Philip. Against that monarch he now endeavoured to stir up the Germanic confederacy, but his barons both in England and France declined to serve. the Emperor Otho was defeated at Bouvines, and John was forced into the peace of Chinon, 1214, whereby he ceded all his territories north of the Loire. He now had to face a league of the English barons, stimulated by Langton, and as a means of escape signed the Magna Charta at Runnymede, June 15, 1215. His undisguised intention to violate this compact and enforce his will by the aid of mercenaries, in which scheme the Pope encouraged him, led the barons to seek aid from France. Louis, the son of Philip, landed in England, and within a few months made himself master of all the south. John, whilst leading his army across the Wash, was caught by the tide, lost all his baggage and treasure, and worn out by fatigue, depression, and excesses, took refuge in Newark, where he died in 1216.

John DON, of Austria, the natural son of the Emperor, Charles V., by Barbara Blomberg, was born at Ratisbon in 1545. Under the name of Geronimo he was conveyed to Spain, privately

educated, and acknowledged by his father before the latter's death. Philip II. treated him as a brother, and he showed his gratitude by revealing the schemes of the Infante Don Carlos. Philip appointed him Captain General of the Spanish Navy, and employed him (1569-70) in the odious task of expelling the Moriscos. He next became admiral of the league against the Turks, and in that capacity won the decisive battles of Lepanto and Navarino (1571-2). The king felt some uneasiness at the growing ambition of his kinsman, whom the Pope encouraged for motives of his own. In 1576 he was appointed to the government of the Netherlands, with a secret design for the subjection of England. William of Orange, however, was able to make some stand against the Austrians and their allies from Parma, when just as the crisis was imminent Don John died at Namur in 1578, not without some suspicions of poison, which were almost warranted by the jealous character of his half-brother.

John OF BRUGES. [VAN EYCK.]

John OF DAMASCUS. [JOANNES.]

John OF GAUNT, or GHENT, Duke of Lancaster, the third son of Edward III. of England, was born in 1340. As Earl of Richmond he married Blanche of Lancaster, and became by her father of Henry IV. On her death he took as his second wife Constance, natural daughter of Pedro the Cruel of Castile and Leon, and claimed that throne in her right, but was defeated by Henry of Trastamare. He served with his brother, the Black Prince, in the French wars, and on the death of the latter appears to have acted virtually as regent. In 1378 he led an expedition into Brittany without much success, and he made a plucky attempt on the death of Henry of Castile to seize the crown, but after much bloodshed accepted a pecuniary compensation, his eldest daughter, Philippa, marrying the King of Portugal, whilst a younger one, Katherine, became the wife of the Prince of the Asturias, ultimately Henry III. of Castile. In 1396 John married Katherine Swynford (sister-in-law, perhaps, of Chaucer), by whom he had already had several illegitimate children, who were ennobled by the king. He died in 1399.

John OF SALISBURY was born at Salisbury a little before 1120, and was of Saxon race. He went early to France and became a pupil first of Abelard and then of the founders of the School of Chartres. Returning to England he was for thirteen years secretary to Theobald, Archbishop of Canterbury, and frequently went on missions to Rome. Thomas à Becket retained his services, and he followed his master abroad, and was present at his assassination. He then retired to France, was made Bishop of Chartres, and died about 1180. His *Life of St. Thomas* and *Life of St. Anselm* are of considerable historical importance, whilst his other works entitled *Polieraticus* and *Metalogicus* throw great light on the state of education and the currents of thought during the reign of scholasticism.

John PRESTER. [PRESTER, JOHN.]

John OF NEPOMUK, or Pomuk, a Romish saint and patron of Bohemia, was born at Pomuk in that country about 1330. Becoming a priest at Prague, where he was made canon and vicar-general, he took part with the archbishop, John of Janstein, who appointed an abbot in opposition to the wishes of King Wenceslaus; and the latter, who had already a quarrel with him because he had refused to reveal the confessions of Queen Sophia, seized the insubordinate churchman, put him to the rack, and finally threw him into the Moldau. After his death many legends attached themselves to his name (indeed, his existence is not beyond doubt), and in 1729 he was canonised.

John, the name of twenty-three popes, the first of whom was elected in 523, whilst the last died in 1419.

John XXII. (JACQUES DE CAHORS) was elected at Lyons in 1316. He took the side of Frederick of Austria against Louis of Bavaria in the dispute for the imperial crown, and was formally deposed by Louis, who invaded Rome. John, however, continued to exercise his authority at Avignon, where he had always resided, and where he died in 1334. He was the author of the decretal known as "the Extravagantes," and was a bitter opponent of the Franciscans.

John XXIII. (BALDASSARE COSSA) succeeded Alexander V., whom he is said to have murdered, in 1410. Originally a corsair, he retained many of his old habits, leading a turbulent and licentious life. Two popes were already in existence at the time of his election, and he was compelled to summon a council at Constance to settle their conflicting claims. The verdict went against him, and he was deposed. The Emperor Sigismund imprisoned him for four years at Heidelberg, but he made peace with Martin V., was appointed bishop of Frascati and dean of the College of Cardinals, but died soon after in 1419.

John I., King of Portugal, the natural son of Pedro I., was born in 1357, and after a struggle against the rival claim of Beatrice, wife of John of Castile, succeeded his legitimate brother on the throne in 1385. He successfully resisted the efforts of the Castilians to subjugate Portugal, and by his strenuous and judicious policy secured the independence and future colonial greatness of his kingdom. In these schemes he was assisted by the sons of his marriage with Philippa, daughter of John of Gaunt, Henry the Navigator being especially distinguished. After a reign of forty-eight years, John died in 1433, and is still spoken of as "the father of his country."

John VI., the last king of that name in Portugal, was acting as regent for his insane mother, Maria I., when the French invasion drove him from Lisbon in 1807. He established himself at Rio de Janeiro as Emperor of Brazil, and allied himself with England and the other powers against Napoleon. In 1816 he succeeded to the throne, but did not return to Portugal until 1821, when he had to suppress the insurrection of his son, Dom Miguel. He died in 1826.

John, or JOHN III., of Poland (Sobieski), was born in 1624, being the son of the Castellan of Cracow. His military abilities put him at the head of the Polish army, and he kept in check the Cossacks of the Ukraine, as well as the Turks, whom he utterly defeated in 1673 at Choczim. Next year he was elected king, and continued his successes, raising the siege of Vienna in 1683. He died in 1696. His granddaughter was the wife of the Old Pretender.

Johnson, ANDREW, the son of humble parents, was born at Raleigh, North Carolina, U.S.A., in 1808. He learned the trade of tailoring, and devoted his leisure to self-education and political agitation, being settled at Greenville, Tennessee. At the head of a Democratic working-men's party, he got a seat in Congress in 1843, and ten years later was elected Governor of his state, from which position he passed to that of Senator in 1857. To the indignation of his party, he adopted the Republican views of Lincoln as regards the preservation of the Union, and in 1864 obtained the Vice-Presidency. The murder of Lincoln a few months later raised him to the Presidential chair, where he was welcomed with a cordiality that did not last long. His tenure of office was one long wrangle with Congress, chiefly as to the terms on which the Union was to be reconstituted, and in every point he was beaten. He then attempted to remove Stanton and other opponents from office, was impeached, and narrowly escaped condemnation. He made way for Grant in 1869, and was contemplating a return to public life when, in 1875, he died somewhat suddenly.

Johnson, SAMUEL, was born at Lichfield on September 18th (N.S.), 1709. His father was a bookseller in the place, who on market days opened a stall at Birmingham and other towns, each of which was then too small to support a regular shop. From him Johnson inherited the "vile melancholy" which clouded his spirits throughout his life, and, to the teaching which he received from him, may be traced the foundation of his belief in High Church and Tory doctrines. As a child he was touched by Queen Anne for the "king's evil," scrofula. As a boy he was educated first at a school in Lichfield, and then, probably in the capacity of pupil teacher, at Stourbridge. On leaving school he lived for two years at home, reading in a desultory manner, and, no doubt, acquiring the scholar's knack, for which he was afterwards famous, of going straight to the valuable points of a book, without waste of time upon the unnecessary padding. In 1728 he entered Pembroke College, Oxford, but spent a chequered life at the university. We have hints of his delight in vexing the tutors and fellows, and glimpses of him lounging at the College gate, and holding a group of friends entranced by his conversation, of an attack of hypochondria, of a deep religious impression through the reading of Law's *Serious Call*, of a poverty so great that his feet peeped through his shoes, and of a pride so high that he flung away the pair of boots which a friend delicately placed at his door. He left without a degree, probably on account of his straitened circumstances, and was usher for a few months in a school at Market Bosworth, where he was

harshly treated by Sir Wolstan Dixie, in whose house he acted as a kind of chaplain. He then settled for a time in Birmingham, where he published his first book, a translation from the French of Lobo's *Voyage to Abyssinia*. In 1736 he married Mrs. Porter, the widow of a Birmingham mercer, twenty years older than himself, who had the sense to discern beneath his "tumultuous and awkward fondness" the qualities which made him great. He next opened a school at Edial, near Lichfield, where almost his only pupils were David Garrick and his brother. Renouncing the scholastic profession, he went to London in 1738, and there wrote part of *Irene*, a tragedy, which was not brought out until 1749, when Garrick placed it on the stage without any great success. The year 1738 was also marked by his publication of a most popular poem, "London," in imitation of the Third Satire of Juvenal, and by his first contribution to *The Gentleman's Magazine*, for which, a little later, he composed more or less imaginary reports of the debates in Parliament, called, by a thin disguise, "The Senate of Lilliput," taking care, as he afterwards boasted, not to "let the Whig dogs have the best of it." These employments, however interesting, were not particularly well paid, and at times the poor author was obliged to roam the streets all night for lack of money with which to pay for a lodging. His companion on these occasions was Savage, whose life he wrote in 1744. It was not until 1747 that he obtained profitable work, when he undertook, for a payment of £1.575, to write "A Dictionary, with a Grammar and History of the English Language." The plan of the book was at once published, with a dedication to Lord Chesterfield, who accepted it graciously, but displayed no further interest in Johnson until 1755, when, on the eve of the appearance of the Dictionary, he wrote articles in praise of its author, who refused so tardy a help in a letter which gave a heavy blow to literary patronage. "Seven years, my lord," he said, "have now passed since I waited in your outward rooms, or was repulsed from your door; during which time I have been pushing on my work through difficulties, of which it is useless to complain, and have brought it, at last, to the verge of publication, without one act of assistance, one word of encouragement, or one smile of favour. Such treatment I did not expect, for I never had a patron before." Meanwhile, in 1749, Johnson had published another imitation of Juvenal, *The Vanity of Human Wishes*. Between 1750 and 1752 he brought out a periodical, *The Rambler*, which passed through two editions in London during his lifetime, and between 1758 and 1760 a similar production, *The Idler*. In 1752, to his deep and lasting regret, he lost his wife. Some years later, to defray the expenses of his mother's last illness, he wrote, in the evenings of a single week, one of his most popular books, *Rasselas*, the story of a prince who illustrated his favourite doctrine of the vanity of all things earthly. In 1762 he received a pension of £300 a year, the greater part of which he devoted to charity, turning his house into a home for several poor friends. He lived himself much with the Thralls, a brewer and his wife, at Streatham and Southwark, and, when

in town, he spent his evenings in the company of Reynolds, Goldsmith, Burke, and other eminent men, at "The Literary Club," which was founded in 1764. He brought out an edition of Shakespeare in 1765, an account, ten years later, of his visit to the Hebrides with Boswell, and a few political pamphlets, of which one, *Taxation no Tyranny*, attempted to answer the claims of the colonists at the beginning of the American War. His last great work, *The Lives of the English Poets*, was published in 1781. He died on December 13th, 1784. His writings are now, perhaps, less read than they deserve to be, on account of the pompous style of much of his prose. He lives to the present generation, in the pages of Boswell's biography, as the literary dictator of his time. He comes before us, already an elderly man, with awkward gestures and slovenly habits, but with a great tenderness of heart and a ready, though rough, wit which makes his conversation as fresh as if just spoken. To know him in his home, at his club, in the Highlands, at Streatham, is to live again in the very life of eighteenth-century England.

Johnston, ALBERT SIDNEY, born in Kentucky, U.S.A., in 1803, was educated at the West Point Military College, and after serving for some years in the United States Army went to Texas, enlisted as a private, and rose in a few months to the chief command. From 1840 to 1846 he farmed land as a simple citizen, but in the latter year took part in the Mexican War. He next received a major's commission from the United States Government, and in 1857 was entrusted with the expedition to Utah. Superseded later on for his Secessionist views, he accepted a command in the Confederate Army, and was killed at the Battle of Shiloh in 1862.

Johnston, ALEXANDER KEITH, was born at Kirkhill, near Edinburgh, in 1804, and educated at the High School. Joining his brother as an engraver and printer, he took up map-making and general geography with ardour, and produced in 1843 the *National Atlas*, which won for him the position of Scottish Geographer Royal. His splendid *Physical Atlas* appeared in 1848, and was followed by the *Dictionary of Geography*, *The Royal Atlas*, and many other valuable publications. Most of the learned and scientific bodies of Europe bestowed honours upon him, and in 1871, the year of his death, he received the Victoria Medal of the Royal Geographical Society. His son of the same name assisted in his later enterprises, but only survived him eight years.

Johnston, HENRY HAMILTON, F.R.G.S., was born at Kennington, Surrey, in 1858, and educated at King's College. He subsequently studied with success in the Royal Academy School, but in 1880 began a life of adventure by travelling in Tunis and Algeria, whence he passed to the Congo and West Africa, and in 1884 led an exploring party to Mount Kilimanjaro. He was now appointed Vice-Consul for the Cameroons and Oil River, being transferred in 1887 as Acting Consul to Benin and Biafra, and in 1888 becoming Consul for Portuguese East Africa. More recently he has acted as Commissioner and

Consul-General in the region N. of Zanzibar, including the lakes. He is the author of several important works, such as *The River Congo*, *The Kilimanjaro Expedition*, and *The History of a Slave*.

Johnston, GENERAL JOSEPH ECCLESTON, was born in Virginia, U.S.A., in 1807, and graduated at West Point. Entering the army, he had attained the position of Quartermaster-General when in 1861 the Civil War broke out. He resigned and joined the Confederates, receiving command of all the forces in Virginia, and was severely wounded at Fair Oaks. In 1863-4 he was employed in a vain effort to check Sherman's advance, but after Lee's surrender was forced to capitulate. Until 1885 he disappeared from public life, but was then appointed by President Cleveland to a Commissionership of Railways. He published, in 1874, a record of his military life.

Joint. A joint or articulation is the term applied to the means of connection between two distinct portions of the animal skeleton. The ends of the bones entering into the formation of a joint are covered with cartilage, and are united to one another by ligaments, while, surrounding and enveloping the apposed surfaces in the case of movable joints, there is what is known as the synovial sac containing synovial fluid, which facilitates the gliding of the one surface upon the other. A joint which does not allow of any movement is termed a *synarthrosis* or *synchondrosis*. Movable joints are classified as *amphiarthrosis* (symphysis) and *diarthrosis*; the mobility in the former being only partial, while in the latter it is considerable. Diarthrosis includes the more familiar forms of joint, such as the hinge-joint or ginglymus, *e.g.* the elbow and ankle; the ball and socket-joint, *e.g.* the hip and shoulder; the gliding joint, *e.g.* the articulations of the wrist; the pivot joint, *e.g.* that between the first two vertebræ; and the condyloid joint, *e.g.* those between the wrist-bones and the first phalanx of the fingers.

Diseases of Joints. *Synovitis* is inflammation of the synovial membrane of a joint. It may be acute or chronic. In the acute form the inflammatory effusion may become purulent, leading to the formation of an abscess in the joint. Chronic synovitis may result from injury or be associated with rheumatism, gout, syphilis, etc. In the treatment of synovitis rest is of great importance, and the limb is usually placed in a splint, and blistering may be employed, or some form of mercurial ointment used. In the event of the formation of pus in the cavity of the joint, an operation is usually necessary. *Hydrops articuli* is a condition in which the synovial cavity becomes distended by watery effusion. It is a not uncommon after-result of synovitis, and is sometimes a very persistent affection.

Arthritis is the term applied when inflammation affects all the structures entering into the composition of a joint. An acute form of arthritis is met with in young children. Arthritis may be of tubercular origin (HIP-DISEASE), and a common form of joint inflammation is what is known as chronic rheumatic arthritis or osteo arthritis.

Loose bodies are sometimes met with in joints, the knee being most frequently affected; they may consist of pieces of cartilage which have become detached, or may originate in a hypertrophied portion of the synovial membrane. Their treatment usually calls for surgical interference.

For the stiffening of joints see *ankylosis*.

Excision of a joint is an operation which has been frequently performed of recent years in cases in which amputation of the affected limb would have been formerly deemed necessary. JOINTS, in *Geology*, are divisional planes occurring in many rocks, both aqueous and igneous, independent of any original stratification, but of the highest practical importance as facilitating quarrying. Thin beds free from joints are known as *flagstones*. The joints in sedimentary rocks are generally in two sets, those of each set parallel, but the two sets at right angles to one another and to the bedding-planes of the rock. Two joints of each set and two planes of bedding thus form six sides of a cuboidal block of stone, and a rock so divisible is termed a *freestone*. Among inclined rocks one set of joints is commonly parallel with the strike (q.v.) and the other with the dip, and they are known as *strike-* and *dip-joints* respectively. One set, commonly the strike-joints, is often more strongly marked, more gaping, than the other, and is known to quarrymen as the *master-joints*, the others being called *cutters*. In coal-mining the main galleries are generally carried along the master-joint, *face*, or *cleet* of the coal, in which direction it has a smooth, polished surface, the cross-galleries being along the less strongly jointed *ends* of the coal, which appear broken. Even hand specimens of coal exhibit a cuboidal form, four faces formed by these joints and two by the powdery, flaking bedding-planes, sometimes bearing fossil leaves. A thick-bedded limestone in which the joint-planes are not sharply cut is termed a *ragstone*. Such jointing in aqueous rocks seems to be the result of strains set up during upheaval or folding. The production of rectangular jointing by strain has been experimentally illustrated by M. Daubrée by wrenching thick plates of glass. Though known by the same name, it is probable that the joints in igneous rocks are quite distinct in mode of origin, they being apparently entirely the result of shrinkage during cooling. The most remarkable joints among igneous rocks are those in basalts, which divide them into very regular columns perpendicular to their surfaces of cooling. In the sheets of Antrim, Fingal's Cave, or Idaho, for instance, this *columnar jointing* is vertical; but in dykes the columns are often horizontal, two sets having clearly originated one from each cooling surface. They are often, but by no means always, six-sided, being seemingly due to the intersection of three sets of joints at angles of about 120°; but they are frequently also intersected by a fourth set, parallel to the surface, and have sometimes an elaborate ball-and-socket articulation at the intersections. The whole of these structures is believed to be explicable as the result of the cooling of a rock not perfectly homogeneous from an extended surface. In addition to their importance in quarrying, joints largely determine

the direction of percolating water and consequent weathering. Limestone caverns are often dissolved out along lines of joint: frost, acting along similar lines, detaches masses from cliffs; and the granite tors of Devon and Cornwall are similarly produced. Weather or sea acting mainly along one set of joints may form *buttresses*, as in the Carboniferous Limestone of Derbyshire dales; or, subsequently acting along the other, may convert such buttresses into *pinnacles* or *sea-stacks*, as in the Saxon Switzerland or off the coast of Caithness.

Joint tenancy. When lands are granted to two or more persons to hold to them and their heirs, or for the term of their lives, or for the term of another's life, without any restrictive, exclusive or explanatory words, all the persons named in such grant, to whom the lands are so given, take a joint estate, and are thence called joint tenants. On the death of either, without partition, the estate descends to the survivors, but the jointure may be destroyed by alienation of one joint tenant, whereby the joint tenancy is severed and a "tenancy in common" ensues.

Jointure. A settlement of lands or tenements made to a woman on account of marriage. It is defined by Lord Coke to be a "competent livelihood of freehold for the wife of lands or tenements, etc., to take effect presently in possession or profit after the decease of her husband, for the life of the wife at least." The woman on whom such a settlement of lands is made is termed a jointress. To a legal jointure five incidents are necessary. 1. The provision for the wife must take effect in possession or profit immediately after her husband's death. 2. It must be for her own life, at least, and not *pour autre vie*, or for any term of years, or for any smaller estate. But the widow will be bound by the acceptance of a precarious interest if she were adult at the time of agreeing to the jointure. 3. It must be made to herself and no other in trust for her. 4. It must be made in satisfaction of the whole, and not of part of her dower. 5. It must be either expressed or averred to be in satisfaction of dower. It may be made either before or after marriage: if made after marriage she may waive it, and claim her dower, unless it be provided by Act of Parliament. [DOWER.]

Joinville, JEAN DE, was born of distinguished family in Champagne, France, in 1224. He took service under the Counts of Champagne, went to the court of Louis IX., and in 1248 joined that king in the first crusade, shared his captivity, and returned with him at the end of six years. Deeply attached to his saintly master, he remained one of his close personal attendants until his departure on his fatal expedition, and he bore testimony in favour of his canonisation. He was over seventy when, at the request of Jeanne de Navarre, he began to compile his *Histoire de St. Louis*, and it was not completed until 1309. His gossiping and even garrulous chronicle is exceedingly interesting, but it is redeemed from pettiness by the honest veneration which is everywhere shown for the character of the chivalrous king. The writer died at the age

of ninety-five on his estate at Joinville, which in 1688 passed to the Dukes of Orleans, and so gave a title to a younger member of that family.

Joinville, FRANÇOIS FERDINAND PHILIPPE, ETC., D'ORLEANS, PRINCE DE, the third son of Louis Philippe of France, was born at Neuilly in 1818, and entered the French navy very early, becoming lieutenant in 1836. With the Duc de Nemours, his brother, he took part the following year in the capture of Constantine. His next service was in Mexico, where he assisted in bombarding San Juan d'Alloa, and led the assault on Vera Cruz. In 1841 he was chosen to escort the body of Napoleon from St. Helena, and two years later he married the sister of Pedro II., Emperor of Brazil. His scientific attainments proved most useful in the adaptation of the French navy to steam power, but his last active employment afloat was in command of the squadron that bombarded Tangiers, and took Mogador in 1844. During the events that led to the retirement of his father in 1848, he happened to be in Algeria with the Duc d'Aumale, and for some years he shared the exile of the Royal Family in England. In 1862 he went through a campaign in Virginia as the guest of McClellan, and in 1870, under an assumed name, he fought in the Army of the Loire. His recent occupations, however, have chiefly been literary, and for the last forty years he has written ably in the French periodicals on naval and military subjects. Devoid of political ambition, animated by a sincere patriotism, and content with the life of a simple country gentleman, he has lived in France under the Republican *régime* without provoking suspicion or ill-will.

Jokai, MOR, or MAURUS, was born at Komorn, Hungary, in 1825. His father, an advocate of strict Calvinistic views, died twelve years later, and the boy, completing his own education, became at the age of one-and-twenty editor of the *Wochenblatt* at Pesth. In 1848 he joined the revolutionary movement, and was present at the surrender of Vilagos, when in despair he contemplated suicide. However, his wife, a famous tragic actress, got him safely back to Pesth, where he abandoned journalism and took to fiction. His novels, novelettes, and plays soon became exceedingly popular, nor did the supply fail. *The Good Old Assessors, A Hungarian Nabob, Sad Times, The White Rose, The New Landlord, A Romance of the Next Century*, and *Black Diamonds* are among the best known. In 1863 he resumed his political writing and founded the *Hon* (Fatherland), which has a larger circulation among the Magyars than any other newspaper.

Jolly Balance, a special form of sensitive spring-balance named after its inventor. A long, fine spiral spring is supported on a vertical stand, and bears a small scale-pan at its lower extremity. The stand carries a long, vertical strip of mirror-glass, on which a scale is engraved. The amount of extension produced by any load in the scale-pan is read off on the scale, the mirror helping to avoid parallax (q.v.), and enabling the observer to take an exact reading. This balance is generally used in estimations of the density of solids or liquids,

where it is unnecessary to know the exact equivalent in weight-units of the extensions produced.

Jolly Boat, a ship's boat, smaller than a yawl, used for going ashore and for light work.

Jomini, HENRY, BARON, the son of a Swiss magistrate, was born at Payerne, in the canton of Vaud, in 1779. Though yearning for a military life, he entered a French bank, but the Swiss Revolution called him home, and at the age of nineteen he became Chief Secretary of War. In 1801 he returned to Paris, and Ney took him as his private secretary. His *Traité des Grandes Opérations Militaires*, presented to Napoleon on the field of Austerlitz (1805), brought him into favourable notice, and when next year he published his essay on the prospect of a war with Prussia, the Emperor attached him to his person. After the Peace of Tilsit he was made chief of Ney's staff, but the jealousy of that general during the Spanish campaign of 1808 drove him to seek employment from the Tsar. Napoleon forbade this, and on his refusal to serve against Russia appointed him Governor of Wilna, in which capacity he did much to facilitate the retreat from Moscow. The Battle of Bautzen was won chiefly through his strategy, yet he failed to secure his share of the rewards, and he finally joined the Russian Army, assisting in the German campaigns, but declining to take part in the invasion of France. After 1815 he settled in Paris, where he produced his great works, *Principles of Strategy*, *History of the Campaigns of the Revolution*, *The Public and Military Life of Napoleon*, etc. He served in the Turkish War of 1828, and superintended the military studies of the Tsarevitch, dying in Paris in 1869.

Jonah, the character who plays the chief part in the Scriptural book that bears his name, is only once mentioned elsewhere in the Old Testament, viz., in the Second Book of Kings xiv. 25, where one of his prophecies is said to have been fulfilled in the reign of Jeroboam II. The references to Jonah in the New Testament show that the symbolical character of the book had a strong hold upon the Hebrew mind. The style betrays archaisms and possibly interpolations, which may or may not point to the existence of some ancient original or to an artificial imitation of primitive models.

Jones, ERNEST CHARLES, the son of an equerry to the Duke of Cumberland, was born in Berlin in 1819, and having come to England attracted notice by a clever romance, *The Wood Spirit*, published in 1841. He was called to the bar, but neglected his profession to take up the Chartist movement, of which he became the literary leader. So zealous was he that he refused a fortune of £2,000 a year coupled with the condition that he should abandon the cause. In 1848 he was sentenced to a couple of years' imprisonment for sedition. He wrote in jail with his own blood on the leaves of his prayer-book, ink and paper being denied him, an epic poem entitled *The Revolt of Hindustan*. On his release he made several ineffectual attempts to enter Parliament, and was at last successful in Manchester, but on January 26,

1869, three days after his election, died from the effects of a chill incurred in the contest.

Jones, INIGO, "the English Palladio," the son of a clothworker, was born in London in 1572. Nothing is known as to his youth, except that he went to Italy, possibly through the generosity of the Earl of Pembroke or the Earl of Arundel, to study art. He came back with some reputation, and in 1604 was invited by the King of Denmark to Copenhagen, where he designed the Rosenborg and Frederiksborg palaces. He thus secured the patronage of Anne of Denmark and Prince Henry, by whom he was employed in providing scenery for masques, in which capacity he fell foul of Ben Jonson, who treated him with utter contempt. In 1612 James I. appointed him surveyor-general of royal buildings, and commissioned him to rebuild the palace at Whitehall. The banqueting-house was the only part that he completed, and it is the best of his works, among which may be reckoned St. Paul's, Covent Garden, the Queen's House, Greenwich Park, the Piazza, Covent Garden, Lincoln's Inn Fields, and the remarkable Corinthian portico of St. Paul's, besides numberless country mansions. He continued to hold his offices under Charles I., and was heavily fined by the Commonwealth as a malignant. In poverty and sorrow he struggled on for two years after the king's execution, dying in 1651.

Jones, OWEN, the son of a prosperous furrier and Welsh archæologist, was born in London in 1809, and carefully educated as an architect. Powerfully impressed by the sight of the Alhambra, he concentrated his attention on the internal decoration of buildings, and may fairly be said to have brought about a revolution in taste, especially as regards the use of colour. He took part in the creation of the Exhibition of 1851, and arranged the beautiful courts in the Crystal Palace at Sydenham, having as his colleague Sir Digby Wyatt. He built St. James's Hall in 1858, but most of his later years were spent in the decoration of private mansions, one interesting exercise of his skill being the adornment of the Palace of the Khedive. He also wrote many books on his favourite theme, and of these *The Grammar of Ornament* is the most valuable. He died in 1874.

Jones, PAUL, properly John Paul, a notable corsair, was born at Kirkbean, Kirkcudbright, in 1747, and was the youngest child of the head gardener to Mr. Craik of Arbigland. Bound apprentice at the age of twelve to a captain in the American trade, he afterwards shipped in a slaver, and at one-and-twenty obtained command of a brigantine. He next became a smuggler, and then a trader to the West Indies. In 1773 he was left some property in Virginia and went to America, assuming there the name of Paul Jones. In 1775 he obtained a lieutenant's commission in the newly-organised Continental Navy, and served at the capture of New Providence. Soon afterwards he was given command of the *Providence* sloop, and cruised with much success against the English trade, exhibiting great boldness and resource. His

next ship was the *Ranger*, 26, and in her he crossed to France, where he seems to have obtained recognition of the American flag. Thence he made a rapacious descent on Whitehaven and St. Mary's Isle, and captured the British sloop *Drake* off Belfast Lough. Later, his own crew having mutinied and gone home, he fitted out an old French Indianman which he renamed *Bonhomme Richard*, with which, in conjunction with other vessels, all French, yet flying the stars and stripes, he made several prizes. On September 23rd, 1779, having with him the *Alliance* and the *Pallas*, 32, he engaged off Flamborough Head the *Serapis*, 44, and the *Countess of Scarborough*, 20, and after a sharp action took both of them, his own ship, however, subsequently sinking. Jones returned to America in 1780 in the *Ariel*, 20, another British prize. He was afterwards entrusted with more than one quasi-diplomatic mission to Europe, accepted a rear-admiral's commission in the Russian Navy, got into hopeless disgrace, and died in Paris of dropsy in 1792. He was a quarrelsome, unscrupulous, self-glorifying scoundrel; but a great seaman and a brave commander.

Jones, THOMAS RYMER, F.R.S., was born in 1810, and having been educated as a surgeon in London and Paris, abandoned practice for the study of comparative anatomy, to the chair of which science in King's College he was elected very early. In 1838 he published his *General Outline of the Animal Kingdom*, and two years later was appointed Fullerian professor in the Royal Institution. He got the Fellowship of the Royal Society in 1844, and as a lecturer and a writer was before the public until his death in 1880.

Jones, SIR WILLIAM, was born in London in 1746. He lost his father, an eminent mathematician, in childhood, but his education was carefully watched by his mother, who sent him to Harrow and thence to University College, Oxford. Even at school he began to study Oriental as well as classical and modern languages, and he had acquired at the age of twenty-two such a reputation that he was invited to translate the life of Nadir Shah into French, and this he followed up by a metrical version of Hafiz. Five years were spent as tutor in Earl Spencer's family, and then the young scholar began to read for the bar. He found time, nevertheless, for a reply to Anquetil du Perron, for a Grammar of the Persian Language, and for two volumes of criticism, before devoting himself to his profession. In 1776 he was appointed Commissioner in Bankruptcy, and in 1783 he became Judge of the Supreme Court at Calcutta. He now took up the study of Sanskrit, and produced a translation of the *Sakuntala*, the *Hitopadesa*, the *Ritusamhara*, and part of the *Vedas*. Moreover, he commenced *A Digest of Hindu Laws*, completed by Colebrooke, and he founded the Asiatic Society. His last work, a translation of *The Institutes of Manu*, appeared in 1794, just before his sudden death from liver disease. As a pioneer of Aryan philology he did an important work, though his own contributions to the new science were not very valuable.

Jongleurs, the name of minstrels or gleemen of France and Norman England in the Middle Ages, who made their livelihood either by playing instruments and acting for Troubadours, or by themselves story-telling and jesting, and also by tricks and buffoonery. They sometimes formed themselves into bands. Some were composers of songs and fabliaux. The old French form *jogleor* became in English *juggler*.

Jonquil (*Narcissus Jonquilla*), a small, many-flowered yellow species of *Narcissus* (q.v.), from the flowers of which a bitter, yellow, fragrant essential oil is extracted by ether.

Jordan (Heb. "Swift-flowing"), the chief river of the Holy Land, has its source in a cave at Banias (Cæsarea Philippi), but is joined early in its course by a stream from Tell-el-Kadi in Dan, and by another from Hermon, either of which might claim to be the true Jordan. Descending rapidly with a fall of some 80 feet per mile, the river passes through Lake Merom (Huled), and enters the Sea of Galilee, from which it issues at a much reduced speed, the fall being no more than a dozen feet per mile in the plain of Beisan, and four or five feet as it makes its way through the muddy flats to the Dead Sea. The total length is 104 miles, and the average width below the lakes about 40 yards. The upper reaches are much obstructed by growths of reeds and shrubs, and though narrow it is deep, and can only be passed by the fords, of which there are many, the most famous being that of Bethabaca, near Jericho. In the spring it is subject to floods. The most important affluents are the Hieromax and Jabbok from the E., and the Jalud and Faria from the W.

Jordan, CAMILLE, born at Lyons in 1771, became a strong supporter of the Royalist cause, and when Lyons was taken by the Convention in 1793 had to fly for his life to Switzerland, and thence to England. Returning to France in 1796, he sat in the Council of the Five Hundred, but had to escape by exile the *coup d'état* of the 18th Fructidor. Though he boldly denounced Napoleon, he was allowed to come back and live peacefully at Lyons, writing much on German literature. The Restoration brought him rank and political position, which he used to resist reactionary measures in the Chamber. He died in 1821.

Jordan, MRS. (DOROTHEA BLAND), was born at Waterford, Ireland, in 1762, her mother being a strolling player. The girl made a brilliant début as Phœbe in *As You Like It* at the Dublin Theatre, and then, coming over the water, adopted from this fact the stage name of "Jordan," appearing at Drury Lane in 1785. She soon became a great favourite in comedy, and her beauty and wit attracted the attention of the Duke of Clarence, with whom she lived maritally from 1790 to 1810, and bore him ten children, the eldest of whom was created Earl of Munster. When it became obvious that the Duke would succeed to the throne, a separation was unavoidable. Her last appearance was at Covent Garden in 1814. After that misfortunes overtook her, bankruptcy followed, and

she retired to St. Cloud, where she died neglected and penniless in 1816.

Jordan, SIR JOSEPH, British naval commander, was born in 1603, and after much service as acting vice-admiral in the first Dutch War. and as rear-admiral under Blake in the Mediterranean, commanded the *St. George*, 60, and acted as flag-officer through the second Dutch War. He succeeded Lawson in 1665 when that officer was wounded. He commanded a flotilla of fire-ships against the Dutch at the Nore in 1667, and he was vice-admiral of the Blue at the Battle of Solebay. He died in 1685, and lies buried at Hatfield.

Jortin, JOHN, the son of a French Protestant refugee, was born in London in 1698, and went from Charterhouse to Jesus College, Cambridge, where he distinguished himself as a Greek scholar, and gave help to Pope in translating Homer. He was ordained soon after taking his degree, and ultimately became Vicar of Kensington and Arch-deacon of London, dying in 1770. Among his works are *Discussions Concerning the Christian Religion*, *Remarks on Ecclesiastical History*, *Life of Erasmus*, and *Tracts, Philological, Critical, and Miscellaneous*.

Jorullo, JURUYO, or XURULLO, a volcanic mountain in Mexico, 75 miles S.S.W. from Valladolid and 80 miles from the Pacific coast. It was suddenly upheaved on September 28-9, 1759, in the midst of a fertile plain, the disturbance extending over an area of 4 miles by 3 miles, and the central crater having an elevation of 4,265 feet above sea level. Since that date there has been little sign of activity, and the flanks are covered with forests.

Josephus, FLAVIUS, the Jewish historian, was born at Jerusalem in the year 37. The facts of his life rest upon his autobiography. From this we learn that he was of good family, and he was remarkable for his learning from early youth; that after living three years in the desert he became a Pharisee; that in the year 63 he went to Rome, where, through the intercession of Poppæa, he obtained the release of some Jewish priests; and that, on his return three years later, he took the command of the Jews when Galilee rose against the Romans. He held out in Jotapata for nearly fifty days, and then surrendered. His life was spared, but he was kept in chains for three years. He gained the favour of both Vespasian and Titus, and urged the Jews to surrender to the latter. After the fall of Jerusalem he lived as a Roman pensioner till about 103, when he died. He had played a double part, and was trusted neither by the Romans nor by his own countrymen. His *Jewish War*, originally written in Aramaic, but translated by the author into Greek, is a vivid narration of Jewish affairs from the time of the Maccabees to the year 73. It is generally accurate, but was written with an eye to his patrons, being submitted to Vespasian, Titus, and Agrippa. His chief other work was *Antiquities of the Jews*, a learned but unequal account of the early history of his nation, based mainly on the *Septuagint*, the first

book of Maccabees, Strabo, and Nicolaus of Damascus.

Joshua ("whose help is Jehovah"), the successor of Moses, was the son of Nun of the tribe of Ephraim. He is first mentioned as chosen by Moses to lead the Israelite host against Amalek in the fight at Rephidim (Exodus xvii. 9). He accompanied Moses to the foot of Sinai when the latter first went to receive the two tables, and was one of the twelve who were sent to explore Canaan, and one of the two who gave a good report of the land. He was in his eighty-fifth year when he became head of the people at Shittim. Under him the chosen people crossed the Jordan, took Jericho and Ai, defeated the Amorite confederation at Makkedah, overthrew the Canaanites under Jabin, and in six years conquered as many nations. The land was then portioned out among the tribes and the Levites; the Tabernacle was established at Shiloh; and the covenant renewed at Shechem. Joshua having delivered two solemn addresses to the people, died at the age of 110 and was buried at his native town, Timnath-serah. "Joshua" is a variant of Hoshea, Jeshua, and Jesus.

Joubert, BARTHÉLEMI CATHERINE (1769-99), a French general of great promise, was born at Pont-de-Vaux, department of the Aisne, and entered the army in 1791. He greatly distinguished himself on the Rhine and in Italy, rendering prominent services at Loano and Lodi, but winning his chief laurels at Castiglione and Rivoli. His campaign in the Tyrol which followed was called by Carnot "le campagne des géants," and forced Austria to come to terms. After commanding in Holland he next gained possession of Piedmont by a brilliant coup. So great was his reputation that he had been selected by the directors to carry out the *coup d'état* which Bonaparte afterwards directed (18 Brumaire); but his career was cut short at the battle of Novi, where he fell mortally wounded.

Joubert, JOSEPH (1754-1824), one of the greatest French writers of his day, was a native of Montignac, Périgord. He lived some time at Paris and enjoyed the friendship of Fontanes, La Harpe, and Marmontel, as well as that of Diderot and D'Alembert. After some years of retirement he again came to Paris, and was the most brilliant figure in the *salon* of Madame de Beaumont. By means of Fontanes he became Inspector-General of the University of Paris. Extracts from his manuscripts were published by Chateaubriand under the title of *Pensées*, and they were republished in more extended form by Ravnal between 1842 and 1849. Sainte-Beuve considered him one of the greatest of French moralists.

Jouffroy, THÉODORE SIMON (1796-1842), a French philosopher, was born at Pontets, Doubs. He studied under Cousin at the École Normale, and in 1817 became assistant professor of philosophy. He became an adherent of the Scotch school, wrote a preface to Stewart's *Moral Philosophy*, and translated some of Reid's works, to which he also wrote a preface. He was for some years a deputy in the French Assembly, but made no mark there

and ruined his health. In 1833 he became professor of ancient philosophy at the Collège de France. His philosophical views are set out in his *Cours de Droit Naturel* (1835), *Mélanges Philosophiques*, and other works published posthumously. He had little originality, but possessed even more than the usual French lucidity in exposition.

Joule, JAMES PRESCOTT (1818-89), the electrician, was born at Salford. He studied under Dalton the chemist at the Manchester Philosophical Society, and very soon began to devote his time to chemical and physical research. He filled successively the offices of library secretary and president of the Manchester Society, was elected F.R.S. in 1850, and received the Copley Medal in 1860. In 1878 he was granted a civil list pension of £200, and in 1880 was presented with the Albert Medal of the Society of Arts, and he also received honorary degrees from Oxford, Dublin, and Edinburgh. His first discovery was connected with the production of heat by voltaic electricity, his second was the equivalence of heat and energy, and he also made various experiments in magnetism. His paper appeared under the auspices of the Physical Society, but edited by himself.

Joule's Equivalent, in *physics*, signifies the numerical connection between the unit of energy expressed in relation to force and space, and the unit of energy expressed as heat. That is to say, heat is a form of energy and may be measured as such. The unit of heat generally adopted is the *calorie*, which means the amount of heat required to raise one gramme of water from 0°C. to 1°C. This being a quantity of energy is expressible as a definite number of foot-pounds, or of ergs, or any other unit of energy we may choose to work with. The calorie is equivalent to 42,000,000 ergs; the pound-degree-Centigrade unit of heat is equivalent to 1,390 foot-pounds of energy; and the pound-degree-Fahrenheit unit to 772 foot-pounds. These numbers are the result of experiment, though any one may be calculated when any other is known. The most accurate experiments were made by Dr. Joule of Manchester, who adopted several methods in his determinations, and showed that all led to the same numerical result. The fact that there is such an equivalent is generally stated as the first law of thermo-dynamics.

Jourdan, JEAN BAPTISTE, COMTE DE (1762-1833), Marshal of France, was the son of a Limoges surgeon. He entered the army in his seventeenth year, and having shown himself a zealous republican as well as a good soldier, attained the rank of general. In 1797 he became a member of the Council of Five Hundred, and was responsible for the law of Conscription of 1798. His views, however, were too liberal for Bonaparte, and after his defeat at Stockach in 1799 he suffered a temporary eclipse. He soon, however, became a member of the Council of State, was employed in Piedmont, received in 1804 his marshal's bâton, and was one of Wellington's opponents in the Peninsula. Having deserted Napoleon on his fall, he was made *pair de France* by Louis XVIII.; but by the part he took in the Revolution of 1830 he returned to

the principles of his youth. He published accounts of some of the campaigns in which he had commanded, notably that of the Army of the Danube.

Journal, in *book-keeping*, a book in which every article and charge is separately entered on the debit or credit side, and classed so as to facilitate posting into the ledger.

Journal, in *engineering*, is that part of a shaft or or an axle that is supported at the bearings. It must be circular in section, and is usually made cylindrical with slight enlargements at each end to prevent lateral motion of the axle. The journal requires careful designing; if the amount of bearing surface is too small, it will become heated under the excessive pressure, the lubricating material will be squeezed out, and the journal will cut into the bearing.

Jowett, BENJAMIN (D.D. Leyden), Master of Balliol College, Oxford, and university reformer, was born in 1817, and educated at St. Paul's School and at Balliol. He became Fellow of his college in 1838, after gaining as an undergraduate the Hertford Scholarship. He was tutor of Balliol from 1842 to 1870, and was appointed in 1855 Regius Professor of Greek. The chief results of his scholarship are translations of Thucydides, Plato, and Aristotle's "Politics;" whilst as a theologian his contribution to *Essays and Reviews* marked him as a man of liberal views. He was Vice-chancellor from 1882 to 1886, and both before and afterwards took a most active part in university affairs.

Juan Fernandez (or MAS-À-TIERRA), an island in the South Pacific, 400 miles from the coast of Chili, to which it belongs. Its area is eighteen miles by six miles. The interior is fertile, and fish in large quantities are taken upon the coast and cured by settlers for the Chilian market. Alexander Selkirk was alone on this island for four years (1705-9). It was used as a penal settlement from 1819 to 1835.

Juangs, an aboriginal people of Orissa, North-East India, occupying the Upper Baitarni valley, and now speaking a rude Kolarian dialect akin to that of the neighbouring Hos. But there is an undoubted strain of Negrito blood in the Juangs, as betrayed by their almost dwarfish stature, dark complexion, and frizzly hair, varying from black to a reddish brown. They are amongst the most primitive inhabitants of India. They burn their dead, but appear to have no clearly developed religious ideas beyond the crudest fetishism. (Dalton, *Ethnology of Bengal*, p. 152). These Jangali ("Jungle People") are steadily dying out.

Juarez, BENITO PABLO (1806-72), Mexican statesman of Indian extraction, first took part in political affairs in 1846. Having been Governor of Oajaca for four years, he was banished by Santa Anna, President of Mexico, in 1852. Three years later, however, he became Minister of Justice under Alvarez, and having been Secretary of State under that President's successor, became the Liberal candidate for the Presidency after Zuloaga's *coup d'état*. After a civil war he was elected by Congress in 1861 to the headship of the State; and Mexico became involved with the European powers on account of his measures. Outrages were committed

on Europeans, and the payment of their debts was suspended for two years. England and Spain joined France in sending troops to Mexico in 1862, but the latter power was soon left alone. Napoleon III. put forward the Archduke Maximilian for the throne, and did not withdraw his support of him until after the protest of the United States Government. The Republican cause was now triumphant; and Maximilian having been captured by treachery, was shot on June 19, 1867. The remainder of the life of Juarez was occupied in the struggle to maintain his position, which he was only able to do by the most arbitrary measures. In 1871 he was defeated by Diaz at the Presidential Election, but retained power by the favour of the populace. He died, however, when his position had begun to become secure.

Juba, a river in East Africa with a town of the same name at its mouth, which is at $0^{\circ} 5' S.$ lat. It marks the boundary of the Zanzibar territory placed under British control by the Convention with Germany in 1890. Its course has been traced some distance northwards.

Jubilee, among the Jews the Sabbatical year in which all land that had been sold was returned to the original owner, and those who had sold themselves for slaves were made free. It probably gets its name from the word yobel, a kind of horn with which it was proclaimed. A somewhat analogous institution was adopted by the Latin Church under Pope Boniface VIII., personal emancipation being represented by remission from the penal consequences of sin. During the year 1300 indulgence was granted to all pilgrims who confessed their sins and visited the Church of St. Peter and St. Paul fifteen times, or if residents, thirty times. According to Boniface the Jubilee was to have been held every 100th year, but the interval was reduced by Clement VI. (1343) to fifty years, and by Urban VI. and Paul II. (1470) to twenty-five years. Paul II. appointed pilgrimages to churches in different countries, and enjoined the pilgrims to contribute towards the Holy Wars. Leo X. substituted the building of St. Peter's Church for the Holy Wars, and this, with the scandalous behaviour of some preachers of the indulgence, helped to bring about the Reformation. The word is also used to denote the fiftieth anniversary of anything; as the Jubilee of Queen Victoria's accession (1887), the Pope's Jubilee, 1893 (the fiftieth anniversary of his episcopate), and for various festivals.

Judah (YEHUDAH = "Praise"), the fourth son of Jacob and Leah. He interceded for the life of Joseph with his brethren, and was the most influential of Jacob's sons. As such he treats with his father concerning Benjamin, and is sent to prepare the land of Goshen for the reception of Jacob. His tribe also took the foremost place, and the most important part of Palestine was assigned to it for territory. Caleb and Othniel were exceptionally favoured in the division. The territory of Judah was about 45 miles long and 50 miles broad. David reigned first over this tribe at Hebron; and after his death it had a separate existence as a kingdom.

Judas, the Greek form of the Jewish "Judah." The chief persons who bore this name were:

1. JUDAS, surnamed Barsabas, a leading member of the Church at Jerusalem, who was chosen with Silas to accompany St. Paul and Barnabas to Antioch when they were to announce that the Gentiles were to be admitted into the Church.

2. JUDAS OF GALILEE, the leader of the revolt in Judæa against the payment of tribute to the Romans (A.D. 6). He was the founder of a sect of a very fanatical character called the Gaulonites.

3. JUDAS ISCARIOT, the betrayer of Jesus. He "kept the bag," and was tempted by his avarice to betray his Master. He afterwards repented and hanged himself. He seems to have been distrusted from the first.

4. JUDAS, most probably identical with LEB-BÆUS or THADDÆUS, another of the Twelve. We know nothing of him, and even traditions vary. By some he is said to have died a martyr's death in Phœnicia; others make him preach in Persia and Mesopotamia. He is distinguished from Iscariot in St. John xiv. 22, and St. Luke calls him "Judas (son?) of James."

Judas Maccabæus. (MACCABÆUS.)

Judas-tree (*Cercis siliquastrum*), a beautiful leguminous tree, growing wild from Japan to the shores of the Mediterranean, with smooth kidney-shaped leaves, glaucous above, and pink or red flowers, which spring from both old and young wood before the appearance of the leaves. From its appearance at this season the tree shares with the elder (q.v.) the sinister reputation of having formed the gallows of Iscariot. Its thin brown pods, nearly six inches long, are seldom produced in England.

Jude, the name of the writer of the "Epistle of St. Jude," one of the shortest and least important books in the New Testament. In v. 1 he calls himself "the brother of James," probably James, the Lord's brother, and then claims to be the Judas named among the Lord's brethren, St. Matt. xiii. 55, St. Mark vi. 3. In v. 17 he distinguishes himself from the apostles, so that most likely he was not Jude the apostle, who was also called Lebbæus and Thaddæus. There has been much discussion concerning St. Jude's Epistle, and it is not in the Syriac Bible, but was early included among the acknowledged Christian scriptures. The Epistle, which is largely identical with the Second of St. Peter, is addressed to Jewish Christians.

Judge. A judge (from the French *juge*, which is from the Latin *judicem*), in England and Wales, is one who presides in a court duly constituted, declares the law in all matters that are tried before him, subject to revision in cases where an appeal is allowed, and pronounces sentence or judgment according to law. The superior judges are those attached to the High Court of Justice, besides which there are the County Court judges and recorders of the several boroughs in the Kingdom, which have a grant of Quarter Sessions. When the judges are popularly spoken of, the judges of the Supreme Court (into which the jurisdiction of the ancient

Courts of Queen's Bench, Common Pleas, and Exchequer have been amalgamated by recent legislation) are meant, including the judges attached to the Chancery, Probate, and Admiralty divisions of the Supreme Court. The judges of the Supreme Court are appointed by the Crown, the County Court judges by the Lord Chancellor. Both classes have retiring pensions, regulated by length of service. No action lies against a judge for anything said or done in his judicial capacity, but if he act without jurisdiction he may be answerable for the consequences. If a judge has a personal interest in the action he is incapacitated from trying it. [JUSTICE, COURTS OF.]

Judge Advocate-General is the adviser of the Crown in reference to courts-martial and other matters of military law. He is generally a member of the House of Commons, and of the Government for the time being. He sometimes acts by deputy duly appointed. The duties of an officiating judge-advocate at a court-martial are to provide accommodation for the court, to administer the oath to the members of the court and the witnesses, to make a minute of the proceedings, and to advise the court on points of law, of custom, and of form, and so far to assist the prisoner as to elicit a full statement of the facts material to the defence. The proceedings of general courts-martial held both at home and abroad are transmitted by the officiating judge-advocate to the judge advocate-general, to be laid before the Crown with a statement by the officiating judge-advocate of any circumstances which, in his opinion, may affect the validity of the decision. In the navy, when a court-martial has been ordered, the person nominated president appoints an officiating judge-advocate or his deputy, and the proceedings are nearly the same as in a military court-martial.

Judges, the Book of, a canonical book of the Old Testament, is a sequel to the Book of Joshua, and relates to the period between his death and the birth of Samuel. Its author, or rather authors—for it must be the work of more than one—are unknown. It has two beginnings (Chap. i. 1; ii. 6). Chapter i. is a history of Joshua's time, and therefore the words "after the death of Joshua" must have been written by someone who wished to make the whole book read continuously with that which precedes it. The history keeps repeating itself. The people fall away and are punished, until Jehovah, pitying them, raises up a judge to deliver and recall them. Then on the death of the judge they again fall away. The principal judges are Othniel, Ehud, Deborah, Gideon, Jephthah, and Samson. It was probably composed about the 8th century B.C.

Judgment, the sentence of the law pronounced by a court of competent jurisdiction upon the matter in the record, and the remedy prescribed by law for the redress or punishment of injuries, the suit or prosecution being the course of proceeding by which the question is brought before the court. Judgments are either interlocutory or final. Interlocutory judgments include all those which are given on the *prima facie* state of the case as brought before the court, and which do not go to the absolute

merits of the case, such as judgments on application for injunction. But the largest class of interlocutory judgments are those which do decide the rights as between the parties, but require some other proceeding to determine the amount to be recovered, and usually a writ of inquiry directed to the sheriff, who impanels a jury for the purpose of assessing the amount of damages. If, however, the suit is for a specified thing or sum, the decision of the court determines it in the first instance, and it is final except as to any point of law which may have been reserved for discussion in the full court or "in banco" in legal phraseology.

Judicial Separation, as between husband and wife, now takes the place of the divorce *a mensa et thoro* (*from bed and board*). It is decreed on the petition of either husband or wife, and has all the effect of the old divorce referred to. It is decreed on the ground of adultery or cruelty, or on the ground of desertion without cause for two years or upwards, and during its continuance the wife acquires as to property, and for many other purposes, the condition of a *feme sole*. If granted on the wife's petition, an order may be made for alimony to the wife, and also for the custody, maintenance, and education of the children; and, on a decree of divorce or judicial separation for adultery of a wife entitled to any property, an order may be made with regard to a settlement thereout for the innocent party and for the children of the marriage. No judicial separation can be decreed if the petitioner (whether husband or wife) has been accessory to, or connived at, or has condoned the adultery; or if the petition is presented or prosecuted by collusion; and the court is not bound to decree the separation if the petitioner has been guilty of adultery during the marriage, or of cruelty, or of desertion, or wilful separation, or of such wilful neglect or misconduct as has conduced to the adultery, or if there has been undue and unexplained delay in presenting the petition. [ADULTERY, DIVORCE.]

Judith, the heroine of an apocryphal book of that name, in which she is described as killing Holofernes, a general of Nebuchadnezzar, King of Nineveh (*sic*), at the Siege of Bethulia. She is an ideal type of heroism, devoid of scruple and unburdened with natural feeling—another Jael. The book cannot be regarded as historical, and some have regarded it as a romance symbolic of the fortunes of the Jewish nation.

Judson, ADONIRAM (1788–1850), an American Baptist missionary, was born at Malden, Massachusetts. Having passed through a theological training he went to India in 1812, and soon proceeded to Burmah, where he lived first at Rangoon and afterwards at Ava, being imprisoned at the latter place during the war. He soon acquired a competent knowledge of Burmese, into which language he translated the New Testament. He afterwards compiled a Burmese-English dictionary. He died on his way to Mauritius. Judson's first wife wrote a History of the Burmese Mission; his third was Fanny Forrester.

Juggernaut (JAGANATHA, "LORD OF THE WORLD"), or PURI, a town on the south coast of

Orissa, Bengal Presidency, situate between the delta of the Mahanadi and Chilka Lake. It is celebrated for its temple of Vishnu, or Jagannath, as he is here called. Twenty-four festivals are held annually in honour of the Hindu god, attended by many thousands of pilgrims who bring rich offerings. At one of these he is dragged on a high car with sixteen large wheels to his house on the coast. It had been stated by many Christian writers that worshippers had been accustomed to throw themselves by hundreds before the car, which passed over their bodies, and this celebration has until recently been pointed to as a glaring instance of heathen superstitious barbarity; but H. H. Wilson and Sir W. Hunter have shown that the worship of Juggernaut does not involve the voluntary sacrifice of human beings.

Jugurtha, king of Numidia, the country which corresponds to what is now Algiers, Tunis, and Tripoli, was an illegitimate son of Mastanabal, who shared with his two brothers, Micipsa and Gulussa, the kingdom that had been held by Masinissa (q.v.). Jugurtha passed his youth with the Roman army under Scipio Africanus the younger in Spain. On the death of Micipsa, his uncle (118 B.C.), by whom he had been adopted, Jugurtha was called to share the government with Adherbal and Hiempsal, Micipsa's sons; but his ambition led him to claim the whole kingdom. Hiempsal was assassinated, and Adherbal driven out of the country. The latter appealed to the Romans, but Jugurtha's envoys succeeded by bribery in obtaining for him the western and more fertile part of Numidia. Jugurtha, however, did not respect the settlement, and put his cousin to death at Cirta. In 111 B.C. Rome declared war against Numidia, but Jugurtha bribed the consul Calpurnius Bestia into according him an advantageous peace; although, however, the former appeared at Rome to justify his conduct, the treaty was disavowed. Nevertheless, Jugurtha defeated Spurius Albinus and drove all the Romans out of his territory, and even when Metellus was placed in command no very decided success was gained over him. At length, however, the military skill of Marius and the diplomacy of Sulla, aided by the treachery of Bocchus, who betrayed his son-in-law into an ambush, the war was brought to a close, and 104 B.C. Jugurtha was led in triumph to Rome, where he perished in the prison beneath the Capitol. The Jugurthine War, an account of which was written by Sallust, was remarkable not only for the ability shown by Jugurtha and the later Roman generals, but also as being an important episode in the political history of Rome.

Jujube, a name now applied to a confection of gum and sugar, sold in small cubes as lozenges, in imitation of those formerly made for pectoral complaints with a decoction of the fruits of *Zizyphus vulgaris* and *Z. jujuba*, tropical and sub-tropical trees belonging to the buckthorn family. These fruits are still used as dessert.

Jujuy, the name of the northern province of the Argentine Republic, as also of its capital, and the river on which the latter stands. Wheat and the

sugar-cane are grown, and the province has large but only partially developed mineral resources. Cattle, fruits, and chicha brandy are exported to Bolivia.

Jukagirs, a nearly extinct people of North-East Siberia between the Lena, Indigirka, and Kolyma rivers, and in the New Siberian Archipelago, remnant of a large family which included the Omoki, Shelagi, and many others. Not more than twelve persons still speak the Jukagir, which appears to be a stock language, unrelated either to the Mongolo-Tatar or to any other linguistic family. The Omoki were fishermen on the coast, the Shelagi reindeer nomads, and the collective national name of all was Andon Domni, or Odul-pa ("Men"). The type appears to have been quite different from the Mongolic, and more like the European—the features being long and regular, the nose straight, the cheek-bones but slightly prominent, and the complexion almost white, especially amongst the women. (Schiefner, *Die Sprache der Jukagiren*, in *Bulletin de l'Académie de St. Petersbourg*, vol. xvi.)

Jukes, JOSEPH BEETE (1811-69), an able geologist, was born near Birmingham, and graduated at Cambridge in 1836. While at the university he studied under Sedgwick, and in 1839 was appointed geological surveyor of Newfoundland. In 1842, two years after his return to England, he went as naturalist to the Australian exploring expedition, and published a *Narrative of the Survey Voyage of H.M.S. Fly* in 1847, after its close. In the same year he was attached to the British Geological Survey, and in 1850 became local director in Ireland. He was a Fellow of the Royal Society, and professor at the Dublin College of Science, and was author of a *Student's Manual of Geology*, and other works.

Julia, daughter of Augustus by his wife Scribonia, was born in 39 B.C. She was married as a child to Marcus Claudius Marcellus, and on his death to Vipsanius Agrippa. Her misfortunes began when she was induced to take as her third husband Tiberius, who was afterwards emperor. By him she was banished first to Pandataria, and afterwards to Rhegium, where she died in great distress in A.D. 14. Tiberius had some ground for his action in her infidelity, but the hatred borne her step-daughter by Livia was the main cause of her persecution. Of her children by Agrippa two sons died in youth, and a third was put to death by Tiberius. Her daughters were Julia, who was banished by Augustus for adultery, and Agrippina, who died in exile in Pandataria.

Julian (FLAVIUS CLAUDIUS JULIANUS), a Roman emperor known in history as "Julian the Apostate," was born at Constantinople in 331. His father, Julius Constantius, the brother of Constantine, was put to death, together with most of his kinsmen, by the sons of Constantine in 337. Julian and his brother Gallus were alone spared, the fate of the latter also being deferred for the time only. Julian was brought up a Christian, but under the influence of the rhetoricians soon became a philosophical pagan. His youth was spent in retirement at different places in Asia Minor, but

after the execution of Gallus in 354 he was confined at Milan. By the favour of the Empress Eusebia he was allowed to go thence to pursue his studies at Athens, and in the same year, 355, he was summoned to Milan, married to Helena, sister of Constantius, and appointed governor of Gaul, with the title of Cæsar. In the administration of that province the young student showed remarkable and unexpected powers. The Alemanni were defeated at Strasburg, and the other invaders of Gaul were subdued, the cities they had laid waste were rebuilt, and the burdens of taxation were lightened as much as was possible. So successful had been Julian's administration that the jealousy of the Emperor Constantius was awakened. When, however, an attempt was made to weaken him by the withdrawal of some of his best legions, the army of Paris resisted, and forced Julian to accept the title of Augustus. The troops now advanced towards Constantinople to fight the matter out with Constantius; but in the following year he died, and Julian was sole emperor. He had previously declared his adherence to the old religion, and now issued an edict of toleration. Nevertheless, he indirectly favoured the worship of the old gods to the full extent of his power. The soldiers, on taking the oath of allegiance to the emperor, were at the same time obliged to throw incense upon the altar. While at Constantinople in 361-2 the emperor swept away many abuses. He then proceeded to Antioch, whence he was to start on his campaign against the Persians. Here he was unpopular, and was lampooned by the city wits, to whom he replied by a curious satire on their effeminacy, in which he handles his own character with great freedom. After passing the winter at Tarsus he marched through Mesopotamia, and after defeating the Persian army near Ctesiphon, crossed the Tigris. He was now induced by treacherous promises to march into the desolate interior in the midst of the hot season. His army was surrounded by the Persians, many of whose attacks were repulsed, but in one of them (June, 363) Julian was mortally wounded, and is said to have died crying—"Vicisti Galilæ!" He is also described by Ammianus Marcellinus as addressing his officers in a noble Socratic speech. Julian was at once a soldier, a student, and an administrator. He had something both of the Greek and the Roman in his temperament. He had the rhetorical turn of the former, and the private and civic virtues of the days of the republic; but he had little dignity, and his philosophy was largely mingled with superstition. He was particularly addicted to the practice of divination. Christian writers, like Gregory Nazianzen and Chrysostom, denounced him with great ferocity, but his love of truth and the purity of his life have been judged by cooler heads to have been unimpeachable. Julian's chief work, his treatise against the Christians, is lost, but his *Letters*, *Orations*, and *Satires* are extant.

Julien, STANISLAS AIGNAN, originally Noel (1797-1873), French Chinese scholar, was a native of Orleans. His father, a mechanic, wished him to become a priest, but his linguistic tastes soon

became apparent, and his ability was recognised by his appointment in 1821, assistant professor of Greek at the Collège de France. The lectures of Abel Rémusat, however, soon attracted him to the study of Chinese, which he acquired with such rapidity that at the end of two years he published a Latin translation of part of one of the nine classical books of China (*Meng-tsze*). In 1827 he became sub-librarian to the Institut de France, and in 1832 succeeded Rémusat in the chair of Chinese at the Collège de France, of which in 1841 he was appointed *administrateur*. In 1839 he also became joint-keeper of the Académie Royale. He translated many Chinese tales and dramas, compiled for the Ministry of Agriculture a *résumé* of the Chinese treatises on the cultivation of the mulberry, and in addition to a Chinese grammar published *Voyages des Pèlerins Bouddhistes*, and a rendering of the work of Laow-tsze, founder of the Taon religion. His *Histoire et Fabrication de la Porcelaine Chinoise* is a classic. He was a Sanskrit and Pâli scholar of some eminence.

Julius I., Pope of Rome from 337-352, supported Athanasius against the Arians, but was unable to overcome the opposition of the Eastern church.

Julius II. was born near Savona in 1443, being a nephew of Sixtus IV. His name was Giulio della Rovere. He was educated by the Franciscans and became Bishop of Carpentras and Cardinal in 1471. He afterwards held the archiepiscopal see of Avignon and several bishoprics, and was Papal Legate in France from 1480 to 1484. He acquired great influence in the College of Cardinals, but was defeated by Roderigo Borgia in his candidacy for the Papacy in 1492. He incited Charles VIII. to the conquest of Naples, and was unanimously chosen Pope in 1503. For ten years he occupied the Papal see, during which time he reconciled the Orsini and Colonna; formed a league against Venice with France, the Emperor, and Ferdinand of Aragon, but afterwards joined the Republic against his late allies; formed the Holy League against France, and convened a general council. He died of fever in 1513. Julius II. was the patron of Raffaele and Michelangelo; but his great ambition was to increase the temporal power of the Papal States and to aggrandise his own family.

Julius III. (GIAN MARIA DEL MONTE) was born at Rome in 1487, was created cardinal in 1536, and after taking a leading part at the Council of Trent, succeeded to the Papacy in 1550. He died in 1555, having been remarkable since his election for nothing except his personal magnificence and his patronage of the Jesuits. Under him England was temporarily reconciled to the Roman see.

Jullien (originally JULIEN), LOUIS ANTOINE (1812-60), the well-known conductor, was born at Sisteron, Basses Alpes, his father being a bandmaster. He studied composition without success under Halévy, and left the Paris Conservatoire in 1836 to begin his career as conductor. In 1838 he was for the first time insolvent, and in 1840 first appeared in London, where he conducted concerts at Drury Lane. In December, 1842, he began an

annual series of concerts which lasted till 1859. He popularised music by means of large bands, immense orchestras, the engagement of the best performers, and by great tact in the introduction of classical pieces. A special feature of these concerts were monster quadrilles composed by himself for the occasion. In 1848 he again became bankrupt in spite of his great success, and the year before his death was imprisoned for debt at Clichy. In 1856, when Covent Garden Theatre was destroyed by fire, he lost the whole of his music.

July, the name of the seventh month in the Julian and modern calendars, and the fifth in the old Roman calendar. It had originally 36 days, but the number was reduced first to 31, then to 30, and finally the number was made 31 in the calendar authorised by Julius Cæsar, in honour of whom the old name *Quintilis* was changed to *Julius*. The sun leaves Cancer and enters Leo during this month. It is celebrated for the "July Revolution," when Charles X. of France was set aside and Louis Philippe made king.

Jumièges, ROBERT OF (Robert Champart), a Norman who came to England with Edward the Confessor, and became Bishop of London and Archbishop of Canterbury (1050-2). Having opposed the national party, he was deprived of his see by the Witenagemote on the return of Godwine in 1052, and he passed the rest of his life in the abbey of Jumièges, near Rouen, whence he had originally come. He died there in 1052. WILLIAM of Jumièges, another monk of the same house, wrote a Latin history of the dukes of Normandy, which contains an account of the conquest of England.

Jumna (JAMUNÁ), the chief tributary of the Ganges, rises in the Himalayas in the State of Gurhwál, and flows in a south-easterly direction through the North-West Provinces, and after a course of about 700 miles enters the Ganges at Allahabad. Agra and Delhi are the chief towns on its banks. Its waters are used for irrigation purposes by means of the eastern and western Jumna canals. Its banks are high and its stream clear, but it is of little use for navigation in the greater part of its course during the hot season. It is nearly 11,000 feet above the sea-level at its source, but descends into the plains at an altitude of about 1,200 feet.

Jumpers, small maggots found in cheese, bacon, etc. They are the larvæ of a small black fly, which is the size of a common house fly, but is more slender in form. Its name is *Prophila casei*, Linn.

Jumping, in *athletics*, is divided into two classes—the *high jump* and the *long jump*. The record for the *latter* is 23 ft. 2 in., for the *former* 6 ft. 4 in.

Jumping Hare (*Pedetes caffer*), an African rodent of the same family as the Jerboa (q.v.). It is about the size of and coloured like the English hare, but the hind limbs are enormously developed, and it can cover from 20 feet to 30 feet at a bound.

June, the name of a month; according to the old Roman calendar the fourth, according to the Julian and Modern the sixth. It contained 26 days origi-

nally, which was made 30 by Romulus, 29 by Numa, and 30 by Julius Cæsar, and has continued with this number to the present day. The sun leaves the sign of Gemini and enters the sign of Cancer during this month. It is said to derive its name from Junius Brutus, Cæsar's friend and assassin.

Jung, JOHANN HEINRICH, who called himself Heinrich Stilling, a German of great versatility, was born at Grund, Nassau, in 1740, his father being a charcoal-burner. Having been a tailor and a schoolmaster, then a tutor, he went to study medicine at Strasburg in 1768. Here he made the acquaintance of Goethe and Herder, who encouraged his literary tastes. In 1772 he settled at Elberfeld as a surgeon, and attained great skill as an oculist. Six years later, however, he accepted a lectureship at Kaiserslautern, and in 1787 became a professor of economics at Marburg. In 1803 he came back to Heidelberg, but afterwards went to Carlsruhe, where he died in receipt of a pension from the Grand Duke of Baden in 1817. In 1777 "*Stilling's Jugend*," an account of Jung's boyhood, was published. He adopted the name from the Pietists (*Die Stillen*), whose doctrines he expounded in several works. His autobiography (translated into English in 1835), however, is his only work of permanent interest. Kant and Lavater were friends of the mystic.

Jung, SIR SALAR (1829-83), an Indian statesman of Arab extraction, succeeded his uncle, Suraj-ul-Mulk, as Dewan (or Prime Minister) of Hyderabad in 1853. He rid the country of the Arab mercenaries, reorganised the administration, and averted the annexation by the British which appeared imminent. In spite of the opposition of the people and the apathy of the Nizam, he prevented them from joining in the Mutiny. After the death of the Nizam in 1869, there was a regency, during which Sir Salar Jung could carry out his plans with a free hand. In 1876 he came to England with the object of recovering Berar, which had been ceded to the British for financial reasons; but though knighted and generally honoured, was unable to effect his purpose. He left Hyderabad a model state at the end of his thirty years' government.

Jungar (ZUNGAR), collective name of several historical Kalmuk (West Mongolian) peoples, whose original home was in Kulja. Since the 17th century they were divided into four branches: Chorass, Turgut, Khoshot, and Durbat, each with its own khan (chief), but all recognising the supremacy of the Chorasses. The Turguts, being oppressed by the other Jungars, migrated in 1636 westwards to the Lower Volga; but after the destruction of most of their oppressors by the Chinese in 1756, about 150,000 returned (1770) through the Khirghiz steppes to their old homes, losing half their number on the way. About 100,000 of these Turguts still survive in the Russian government of Astrakhan; but of all the other Jungars nothing now remains except Jungaria (Zungaria), the name of the region forming the heart of their empire, which, during the first half of the 18th century, stretched from Hami to Lake Balkhash. (Kouropotkine, *Les Confins Anglo-Russes dans l'Asie Centrale*, 1879, p. 14).

Jungermannia, a genus of liver-worts (q.v.), originally including almost all the large and varied order Jungermanniaceæ, which agree in bearing solitary sporogonia which usually split into four valves and contain both spores and elaters. It is now restricted to those leafy forms which are *succubous*, i.e. in which the front edge of each leaf is beneath the back edge of the succeeding leaf, and have a free and cleft *perigynæ*, or membranous envelope round each archegonium.

Jungfrau ("Maiden"), a mountain in the Bernese Alps on the border of the canton Valais in lat. 46° 32' N., and long. 7° 58' E. Its summit, which is 13,671 feet above the level of the sea, was first ascended in 1812 by the brothers Meyer.

Jungle, the name applied to the thickets of trees, shrubs, and reeds which are found in many parts of India, particularly at the southern base of the Himalayas and the mouth of the Ganges. The jungle is often impassable, and generally swampy and unhealthy. The jungle *flora* and *fauna* are very peculiar. Wild beasts, snakes, and monkeys abound in the jungle districts.

Jungle Fowl, *Gallus bankiva*, probably the original of our domestic breeds. Used also of other wild species of the genus. Wallace applies the name to *G. furcatus*.

Juniper, a general name for the genus *Juniperus*, belonging to the cypress family among the Coniferæ (q.v.). It includes about twenty-five species of evergreen aromatic shrubs or small trees native to the cold and temperate regions of the northern hemisphere, and represented in a fossil state in Tertiary rocks. The leaves are usually small, acicular, and in decussate whorls of three. The flowers are dioecious, the male ones consisting of several anther-scales, each bearing three or six pollen-sacs, and the female ones of two or three whorls of scales bearing ovules singly at their base. These scales become fleshy and fuse into the fleshy so-called "berry" or *galbulus* of a red or purple colour. There are large oil-glands on the surface of the seeds. *J. communis*, the common juniper, a native of Britain and other northern countries, yields the diuretic berries used for flavouring gin, which derives its name from *genièvre*, the French for juniper. *J. Sabina*, the savin, a poisonously powerful emmenagogue, is used medicinally (and especially clandestinely) to procure abortion. The larger *J. bermudiana*, and the more abundant *J. virginiana*, the "red cedar" of the United States, are largely used for making cigar-boxes, cedar-pencils, and cabinet work.

Junius, the signature of a number of letters by an unknown writer, which appeared in the *Public Advertiser*, edited by Henry Woodfall, from January 21st, 1769, to January 21st, 1772. Soon after he began to write he attracted attention by his knowledge of and attacks on eminent men, amongst whom were Lord Granby, the Duke of Grafton, George III., and many others. The authorship has been attributed to as many as thirty-seven different people, including Sir Philip Francis, Burke, Barré, Wilkes, and Horne Tooke, but the evidence is in no

case conclusive. Whoever he was he did not write for pecuniary gain, as he waived all claim to the profits of his work. The first edition of his letters appeared in 1812. Many works have been written trying to prove who their author was, the most important of which were John Taylor's books: *A Discovery of the Author of the Letters of Junius*; (1813), and *The Identity of Junius with a Distinguished Living Character Established* (1816). These distinguished letters were the forerunners of the leading articles of to-day, which bear so important a part in politics.

Junk. 1. Any remnants or pieces of old cable, used on board ship for making gaskets, mats, points, sennits, etc. 2. A Chinese or Japanese native vessel of burden, usually with three masts and with a short bowsprit fitted on the starboard bow. The shrouds are sometimes only on the windward side. The fore and mainmasts generally have lug-shaped sails made of bamboo; the main-mast has also a cotton top-sail; the mizen, a cotton gaff-sail; and the bowsprit, a jib and sprit-sail.

Junker, WILHELM, the German explorer, was born in Moscow. Having studied medicine in several German universities, he first went to Africa in 1874, when he visited Tunis and Egypt. During the years 1876-8 he penetrated as far south as the Kibbi in the course of his explorations of the Upper Nile. In the following year he went from Cairo to a point on the Welle-Makua or Ubangi River, situated in 22° 47' E. long. and 3° 13' N. lat. He spent about six years in Central Africa, being with Emin for some time, and got back to Egypt by way of Karagwe at the beginning of 1887. An English translation of his *Travels in Africa between 1875 and 1878* appeared in 1890.

Juno, the consort of Jupiter and queen of the gods. She was the protectress of women in general, and of wives in particular. She was worshipped first at Veii and afterwards at Rome, as well as throughout Etruria. She had a sanctuary on the Aventine Hill, and also a temple on the Capitoline, which contained the mint of which she was the guardian genius. Sacrifices were offered to her on their birthdays by women; and on March 1st she had a festival called Matronalia. She presided over all the periods and aspects of married life, and bore the names of Domiduca, Juga, Pronuba, Lucina in reference to each. The month of June, considered most auspicious for marriage, was originally Junonius. In her public capacity she was known as Curiatia or Populonia. Juno is equivalent to the Greek Hera, and Virgil borrows his conception of the Latin deity from Homer's Queen of Olympus.

Junot, ANDOCHE (1771-1813), one of Napoleon's least successful generals, was a native of Bussy-le-Grand, department of Côte d'Or. Having entered the army in 1792, he was present at the siege of Toulon in the following year. He then served in Italy with Bonaparte, whom he accompanied to Egypt, where he distinguished himself greatly and became general of brigade. He fell into the hands of the English on his way back to France, but was

soon released. For two years (1801-3) he was Governor of Paris, which position he again held in 1806. Next year he was sent to invade Portugal, where he gained his title of Duc d'Abrantes. After this, however, his career was a series of disasters: Vimiera, Convention of Cintra, Saragossa. After the Russian campaign he was made Governor of Illyria, as he was considered unfit for active service. He finally threw himself out of window and died from the effects of his wounds. He was a personal favourite of Napoleon and a good soldier, but was not given a marshal's bâton. The extravagance of his wife (*née* Laure Permon) also severely tried the Emperor's patience. The Duchesse d'Abrantes left voluminous memoirs and numerous novels. She died in distress at a hospital.

Junta, in Spain, the name given to a council for administrative or political purposes. When Napoleon organised the Kingdom of Spain under Joseph Bonaparte (1808), he summoned a convention under the name of a junta of 150 notables, of whom 90 assembled. When in a few weeks Joseph had to retire, a fresh junta was formed hostile to the French.

Jupiter, or JUPPITER, the chief Roman deity, is a contraction of Diovis-pater, "the heavenly father." Thus in poetry the form Diespiter appears. He is the sky-spirit, and thus gives rain ("Jupiter Pluvius") and hurls thunderbolts ("Tonans," "Fulminator"). He is also the help of the Latins in battle ("Stator"), and the guardian of their treaties ("Fidius"). His chief temple stood on the Capitol, and was dedicated to Jupiter Optimus Maximus; but there were many others, among which was that sacred to Jupiter Stator at the Mucian gate. He is more distinctively Latin than most of the Roman deities, though in most respects he corresponds to the Greek Zeûs. Jupiter was invoked at the beginning of every undertaking by the Romans; and victorious generals offered up thanks to him and celebrated their triumphs in his honour. He revealed the future by signs in the sky and also by the flight of birds. The Ides of every month were sacred to him and rams were offered up to him on these days, as also at the beginning of every week. He was also the guardian of property, public and private, and as such protected boundaries. As prince of light, white was the colour sacred to him. [SATURN.]

Jupiter, one of the planets of our solar system, is second in brilliancy to Venus, unlike which, however, it is a "superior" planet, having its orbit outside that of the earth. It is about five times as brilliant as Sirius, the brightest of the fixed stars. The orbit of Jupiter is but slightly inclined ($1^{\circ} 19'$) to the ecliptic. Its average distance from the sun is 483 million miles; its distance from the earth varies from 369 to 576 million miles. The length of its year or period of revolution around the sun is 11.86 terrestrial years; its apparent year or *synodic period*, the time between successive conjunctions of the planet with the sun, is 399 days. Its diameter from pole to pole is 83,000 miles; its equatorial diameter is 88,200 miles, and the departure

from perfect sphericity much more marked than in the case of the earth. Its density is 0.24 compared with that of water, and its mass 316 times that of the earth. The length of its day, or period of axial rotation, is about 9h. 55m. The planet is a beautiful object when viewed with a telescope; it is probable that the markings are entirely due to its atmosphere, and that the actual surface of the planet is rarely visible. Jupiter has hardly yet cooled from the condition of incandescence, and it is only slightly solidified. It possesses five satellites, four of which were discovered by Galileo when he applied the telescope first to the investigation of the heavens. The names given to these are Io, Europa, Ganymede, and Callisto; their distances from the planet vary from 262 to 1,169 thousand miles, and their orbits are almost circular. By means of these satellites the first observations of the velocity of light were made. A fifth was discovered in 1892 at the Lick Observatory; it is close to the planet, and performs one revolution in 11 hours 57 minutes.

Jura, the name of a range of mountains running through the western cantons of Switzerland and extending southwards into France. They are formed of several parallel ridges having a length of nearly 200 miles and a breadth of 30 miles in the south, where are the highest peaks—Moleson 6,588 feet, Tendre 5,538 feet, and Dole 5,509 feet. Between the ridges are long valleys. The Doubs and other smaller rivers have their source in this range.

2. A French department takes its name from the Jura range, which occupies its south-east portion. Cattle are reared in large quantities on the rich pastures, and corn and the vine are grown.

3. An island of the Hebrides, west of Scotland, lying between Islay and the mainland, from which it is separated by the Sound of Jura. The island, which is 24 miles long and 8 broad, is very mountainous, the highest peak being 2,700 feet high. Very little of the soil is cultivated. There is a deep inlet in the west called Loch Tarbert.

Juraks, one of the main divisions of the Samoyede race, whose domain stretches along the Siberian seaboard from the Obi to the Yenisei. Two groups: *Primorskié*, those of the coast, and *Karasinskié*, those of the interior, numbering altogether scarcely 300. They dwell in tents, and still practise pagan rites, thrusting bits of raw meat into the mouths of their idols, a reminiscence of human and animal sacrifices. Type and speech not perceptibly different from those of the European Samoyedes (Seebohm, *Journey to the Rivers Obi and Yenisei*, in *Proceedings of the Royal Geographical Society*, 1878).

Jurassic, the name now generally applied to the great series of Mesozoic rocks intermediate in age and position between the Triassic (q.v.) and the Cretaceous (q.v.), from their development among the Jura Mountains. They were termed Lias (q.v.) and Oolite by William Smith, but are so variable lithologically that no such names are desirable. In England they come to the surface between Dorsetshire and the Tees, and have been proved deep down under the south-east counties. They consist

mainly of thick, blue marine clays forming valleys largely occupied by grass-land, with interstratified harder limestones and sandstones, forming sometimes long bold escarpments, such as the Cotteswold Hills, and yielding much useful freestone for building purposes and some iron-ore and coal. The fossil plants are largely gymnosperms (q.v.), cycads, araucarias, arbor-vitæ, and true pines abounding and forming beds of jet (q.v.), lignite-rafts, or even coal. Corals abound in the limestones, which have often an oolitic texture, the most characteristic genera being *Isastræa*, *Thamnastræa*, and *Thecosmilia*. Crinoids, such as *Ectocrinus* and *Apiocrinus*, and still more the echinoids, such as *Cidaris*, *Clypeus*, *Pygaster*, and *Echinobrissus*, are also abundant, and sometimes form whole beds, as do also the brachiopods *Rhynchonella* and *Terebratula*. Pelecypods are more numerous than in any preceding age, oysters (*Ostræa*), with the sub-genera *Gryphæa* and *Exogyra*, scallops (*Pecten*), the related *Lima*, and *Trigonia* being specially characteristic. Cephalopods are represented by hundreds of species of Ammonites (q.v.), occurring in clays and limestones alike, and numerous Belemnites (q.v.). Lobsters and prawns are the prevailing crustacean types, and dragon-flies, may-flies, grasshoppers, and perhaps a butterfly, represent the insects. Ray-like cartilaginous fishes with crushing teeth, such as *Acerodus* and *Pycnodus*, and ganoids, were not uncommon; but reptilian life was at its acme of development. Besides the earliest true turtles, numerous lizards, and crocodiles such as *Teleosaurus* and *Goniopholis*, occur, with the extinct groups including *Ichthyosaurus* (q.v.), *Plesiosaurus* (q.v.), *Pliosaurus*, the flying pterodactyls (q.v.), and some of the gigantic terrestrial Dinosauria (q.v.), such as *Compsognathus*, *Megalosaurus*, and *Atlantosaurus*. The oldest known fossil bird, *Archæopteryx*, and some fifteen genera of rat-kangaroos from two widely separated horizons, complete the series. The Jurassic series has been subdivided as follows, most of the divisions being named from their English development, and many of them being described separately:—

UPPER OR WHITE JURA (Malm).		Maximum thickness in England. Feet.
<i>Upper or Portland Oolites.</i>		
Purbeckian, partly fresh-water, with <i>Ostræa distorta</i>		360
Portlandian, including Bolonian below.		
Portland Stone, with <i>Ammonites gigas</i>		70
Portland Sands		150
Kimeridgian, or Kimeridge Clay with <i>Exogyra virgula</i>		600
<i>Middle or Oxford Oolites.</i>		
Corallian (with Sequanian above), with <i>Cidaris florigemma</i>		250
Oxfordian or Argovian, with <i>Trigonia clavelata</i>		600
Callovian or Kellaways Rock, with <i>Ammonites calloviensis</i>		600
MIDDLE OR BROWN JURA (Dogger).		
<i>Lower or Bath Oolites.</i>		
Bathonian, including Cornbrash, with <i>Echinobrissus orbicularis</i>		40
Forest Marble		450

Great or Bath Oolite, with <i>Terebratula maxillata</i> , with Bradford Clay, with <i>Apiocrinus rotundus</i> and <i>Waldheimia digona</i> , and the Stonesfield Slate below	130
And Fuller's Earth, with <i>Ostræa acuminata</i>	150
Bajocian or Inferior Oolite, named from Bayeux, with the lower part of the Northampton Sands and the Yorkshire coal-bearing "dogger"	270

LOWER OR BLACK JURA (Lias).

Toarcian, named from Thouars, or Upper Lias	400
Middle Lias, Marlstone, or Liassian	200
Sinemurian, or Lower Lias, Hettangian or Infra-Lias, with <i>Ammonites angulatus</i> and <i>planorbis</i>	900

The Jurassic series is generally conformable both to the Triassic below and to the Cretaceous above.

Jurchen, a historical Mongolic people, probably of Manchu stock, who ruled over North China (Kin, or "Golden" Dynasty) till their overthrow by the Mongols. The Jurchens originated the pigtail fashion, which was at first a badge of servitude, but which after 1627 became an honourable national trait amongst the Chinese, though never adopted either by their Manchu or Mongol rulers. Specimens of the Jurchen language are preserved in the collections prepared for the use of the Interpreters' College, Peking, where it appears to have been studied till the year 1658.

Jurisdiction. This term is derived from the Latin word *jurisdictio*, which signifies the "declaration of *jus* or law." He who had *jurisdictio* was said "*jus dicere*" to "declare the law." The whole office (*officium*) of him who declared the law was accordingly expressed by the word *jurisdictio*. Jurisdiction in England means an authority which a Court of Law or Equity has to decide matters that are litigated before it, or questions that are tried before it. The Supreme Court of Judicature has jurisdiction over all England and Wales; but the jurisdiction of other courts is limited to certain territorial space and to certain kinds of business or matters in dispute. When the jurisdiction of a court extends all over the Kingdom it may still be restricted to certain causes which it is empowered to try. If proceedings be commenced against anyone before a court which has no jurisdiction in the matter, the defendant may answer by alleging that the court has no jurisdiction, which is termed pleading to the jurisdiction. When anyone has been convicted by a court having no jurisdiction, the proceedings may be moved into the Queen's Bench division of the High Court by the writ of certiorari and quashed. [CERTIORARI.]

Jurisprudence, from the Latin *jurisprudentia*, which signifies a "knowledge of law." Jurisprudence indicates more than being simply acquainted with the rules of law as they exist in any given system. It means such an acquaintance with them as implies a knowledge of the law as a whole or system, a knowledge of the several parts, of their relation to one another and to the whole. The Roman *jurisprudentes*, who were writers on law, gave to the several rules of law which related to any given division of the whole matter a certain order and consistency. They developed and

explained and arranged that which existed as an incoherent mass. Their influence on the development of law was great, both directly and indirectly, and the compilation of Justinian called the "*Digest*" or "*Pandect*," entirely composed of extracts from the writings of the Roman Jurists, gave to their opinions the force of law in the Roman Empire. Jurisprudence, generally, is conversant about those principles which are inseparable from all systems of law, or common to all systems of law; for, however systems of law may differ in fact, and however much they may appear to differ in form, there are fundamental principles which are common to all. The notion of possession, of property, of most of the ordinary contracts of life, of testaments, of intestacy, and the like, are essentially the same. The notions of person, natural and artificial, of right, of duty, and many other things, are universal and necessarily the same. It is the business of general jurisprudence to explain all these common notions, and to reduce the whole matter to one general form or system with which all particular systems of positive law may be compared. This has been done in various ways by different writers; but the best examples are by the German writers on law. When general jurisprudence becomes a regular part of a law student's education, it will lead to a more comprehensive study of our own law, to a more correct conception of its parts and their relations to one another, and, consequently, to a nearer approximation of the particular law of England to the true measure or standard of general law in those cases in which our particular system deviates from it. The study of general jurisprudence would be a sure, though a slow, corrective of many of the evils under which our existing society suffers.

Jury is an assembly of men authorised to inquire into and to determine on facts, and bound by an oath to the faithful discharge of their duty. The etymological derivation of the term is obviously from *juro*, "to swear," whence we find this institution called in low Latin *jurata*, and the persons composing it *jurati*; in French, *les jurés*; and in English, *the Jury*. In England, when the object is inquiry only, the tribunal is sometimes called an inquest or inquisition, as in the case of a grand jury or coroner's inquest; but, when facts are to be determined by it for judicial purposes, it is always styled a jury. When the trial by jury is spoken of at the present day it signifies the determination of facts in civil or criminal justice by twelve men sworn to decide facts truly according to the evidence produced before them. In the County Courts a jury consists of five only. Inquiry into facts on behalf of the Crown by means of juries was common in England long before the trial by jury was constituted for judicial purposes. The juries now in use in England are a grand jury, a petty or common jury, and a special jury. A grand jury is exclusively incident to a court of criminal jurisdiction. Its office is to examine into charges of crimes brought before them at assizes or sessions, and if satisfied that they are true, or at least that they deserve more particular examination, to return a bill of

indictment against the accused, upon which he is afterwards tried by the petty jury. A grand jury must consist of twelve persons at the least, though in practice a greater number are usually summoned, but twelve must always concur in finding every indictment. Until the end of the 13th century the only qualification required for petty or common juries for the trial of issues in criminal or civil courts was that they should be "free and lawful men"—*freemen* as holding by free services or free burgesses in towns, and *lawful* men, that is, persons not outlawed, aliens, or minors, but entitled to the full privileges of the law of England. The statute 6 George IV., c. 50, entirely remodelled the law respecting juries. By this statute every man (with certain specified exceptions between the ages of 21 and 60 years) who has within the county in which he resides £10 a year in freehold lands or rents, or £20 a year in leaseholds for unexpired terms of at least 21 years, or who being a householder is rated to the poor rate in Middlesex on a value of not less than £30 and in any other county of not less than £20, or who occupies a house containing not less than fifteen windows, is qualified and liable to serve on juries in the superior courts, and also to serve on grand juries at the sessions of the peace and on petty juries at the sessions of the county in which he resides. By the "Jurors Act, 1870," aliens domiciled here for ten years or upwards may be jurors if otherwise qualified, and convicts (unless after pardon) are disqualified. For the several classes of persons exempted from serving on juries *see* the comprehensive schedules to the Act, which include peers, members of Parliament, judges, clergymen, and other ministers of religion, barristers-at-law, certificated conveyancers, and special pleaders if actually practising, solicitors and their managing clerks, officers of courts, physicians, surgeons, if in actual practice, and many others. Special jurors are composed of such persons as are described in the Jurors' Book as esquires and persons of higher degree, or as bankers or merchants. A special jury may be obtained at the instance of either party. There is no statutory remuneration for common jurors. Special jurors are entitled to one guinea per cause under an Act passed in the reign of George IV. After the jury have appeared, and before they are sworn, they are liable to be *challenged* by either party, such challenges being of two sorts—(1) to the array, or (2) to the polls. A challenge to the array is an exception to the whole panel or list of jurors returned for some partiality or default in the sheriff or under-sheriff by whom it has been arrayed. Challenges to the polls are objections to particular persons either on the ground of incompetency, insufficient qualification, or of bias or partiality, or of infamy, as having been convicted of some infamous crime. Upon these challenges the cause of objection must in each case be shown to the court, which decides thereon. One of the jury is appointed foreman, and (after hearing the case and the judge's summing-up) he generally pronounces the verdict of the jury to the judge in court.

Jury Mast, a temporary mast erected to

replace one that has been lost in action or bad weather, or put into a new ship so that she may be navigated to a place at which she can be properly fitted. The term is also applied to a light permanent mast placed in a vessel that is intended to remain in harbour.

Jussieu, ANTOINE LAURENT DE (1748-1836), the most celebrated of a family of French botanists, was born at Lyon. His father and his uncle Bernard, under whom he was trained, were botanists of repute, but Laurent surpassed them. After having been in charge of the Paris hospitals, he was from 1770 to 1826 professor at the Natural History Museum. His *Genera Plantarum*, published in the year of the Revolution, is the basis of the modern classification of plants. His son Adrien (1797-1853) succeeded to his professorship, and was the author of an elementary treatise on botany, as well as the teacher of the rising generation. [BOTANY.]

Justice, COURTS OF. JUDICATURE ACTS. The superior Courts of Justice, prior to the passing of the "Judicature Acts, 1873-75," consisted of the Courts of Chancery, Queen's Bench, Common Pleas, Exchequer, Admiralty, and Probate and Divorce. The jurisdiction of all these were by the above Acts transferred to and became vested in the High Court of Justice, so as to effect a union and consolidation of these several courts, and the London Court of Bankruptcy has since been added thereto as a division of the High Court, and all these courts therefore now constitute (in conjunction with the Court of Appeal, newly established by such Acts) one single supreme tribunal wherein is administered both law and equity; so that if any plaintiff, petitioner, or defendant shall advance an equitable claim or defence, such relief is now given therein as theretofore given by the Court of Chancery, and so that all legal claims, demands, and liabilities existing by common law, custom, or statute, are recognised and given effect to therein as theretofore by any of the above-mentioned courts. A short summary of the jurisdiction of the several courts now amalgamated as above is all that our limited space will admit of.

1. *The Court of Chancery*, otherwise called the *High Court of Chancery*, always deemed in matters of Civil property the most important of any of the superior Courts of Justice, was the principal court in which that part of the law of England known as Equity was enforced, and it is said to have taken its name from the judge who presided over it, the Lord Chancellor. [EQUITY; CHANCELLOR.]

2. *The Court of Queen's Bench*, so called because the sovereign used formerly to sit there in person, whence the style of the court was *coram ipsa reginâ*, was the supreme Court of Common Law in the kingdom. Yet though the sovereign himself used to sit in this court, and still in contemplation of law is supposed so to do, he did not, neither by law is he empowered to, determine any cause or motion but by the mouth of his judges, to whom he is deemed to have committed his whole judicial authority. The jurisdiction of this court was very high and transcendent. It kept all inferior jurisdictions within the bounds of their authority, and

might even remove their proceedings to be determined before it or prohibit their further progress below. It superintended all civil corporations in the kingdom. It commanded magistrates and others to do what their duty required in every case where there was no specific remedy. It protected the liberty of the subject by a speedy and summary interposition. It took cognisance of both criminal and civil causes, the former in what was called the Crown side, and the latter in the plea side of the court. It enjoyed a general jurisdiction and cognisance over all actions between subjects, except matters affecting the revenue of the Crown and matters appertaining to the realty.

3. *The Court of Common Pleas* (otherwise known as the *Court of Common Bench*) took cognisance of all actions between subject and subject, including real actions and actions appertaining to the realty. This court was also in modern times entrusted by the legislature with an exclusive jurisdiction in election matters on appeal from the decisions of the revising barristers and in some other matters as under the Parliamentary Electors' Act, 1868, and the Corrupt Practices (Municipal Electors) Act, 1872. And from the judgments of this court proceedings in error lay primarily to the Exchequer Chamber and ultimately to the House of Lords.

4. *The Court of Exchequer* was at first intended principally to order the revenues of the Crown, and to recover the sovereign's debts and duties, though it afterwards acquired (by usurpation founded on a legal fiction) the additional character of an ordinary court of justice between subject and subject. The court is said to have derived its name from the chequered cloth (*Seaccarium*), resembling a chess-board, which covered the table there and on which certain of the king's accounts were made up, the sums being marked and scored with counters. It was formerly a Court of Equity as well as a Court of Common Law, but its equitable jurisdiction was taken away by a statute passed in the early years of the present reign. The judges were called *Barons*.

5. *The High Court of Admiralty* had jurisdiction to try and determine all *maritime* causes—that is, all injuries committed on the high seas—and, generally speaking, and with the exception of any case otherwise provided for by Act of Parliament, all causes so triable must be causes arising wholly upon the sea, and not within the precincts of any country.

6. *The Court of Bankruptcy*; 7. *The Court of Probate*; and 8. *The Court of Divorce and Matrimonial Causes*, will be found dealt with under their several titles in this work.

Such having been the several courts which were united and consolidated together into the High Court of Justice, it is now constituted a superior Court of Record, and to it is transferred the jurisdiction which, when the Judicature Acts came into operation, belonged to all and any of the several courts as already specifically mentioned: as also the common law jurisdiction which at the same time belonged to the Palatinate Courts at Lancaster and Durham, and also the jurisdiction appertaining to such courts as are created by commissions of assize, of oyer and terminer, and of gaol delivery, or

by any of such commissions. The members, *i.e.* the judges, of the High Court of Justice consist of the Lord Chancellor, the Lord Chief Justice of England, the Master of the Rolls, and puisne judges, and the judges of the Court of Probate and Admiralty.

Justice, CHIEF. Two of the three superior courts of Common Law—viz., the Queen's Bench and the Common Pleas—were formerly presided over by a chief, termed the "Chief Justice," and three or four puisne judges; so was the third court—the Court of Exchequer—but the Chief Justice of that court was designated "Chief Baron," and the puisne judges "Barons." Now that the Courts are amalgamated the title of Chief Justice appertains to the Chief Justiceship of the Queen's Bench Division only, who is a member or judge of the High Court. [JUSTICE, COURTS OF; EXCHEQUER.]

Justices of Peace are persons appointed to keep the peace within certain prescribed limits, for which they hold a commission from the Crown with authority to act judicially in criminal causes, and in some matters of a civil nature arising within their jurisdiction. The origin of justices of the peace, or magistrates, can be traced back to the time of Edward I., for by statutes passed in the early part of this reign it was directed that every county and town should be well kept, and that upon any robbery or felony committed therein *hue-and-cry* should be raised upon the felon, and they that kept the town were to follow him with hue-and-cry from town to town with all the town and the towns near, and, failing capture, the hundred was liable for the damage. In the reign of Edward III. conservators of the peace were appointed whose duty it was to assist the sheriff, coroner, and constable, and they were empowered to imprison and punish rioters and offenders. These conservators were afterwards designated justices of the peace. By a more recent statute of Queen Elizabeth's reign the sheriff or constable was required to make the pursuit both with horse and foot; and to the present day hue-and-cry in that manner may still be made under that and the previous statutes; but this is seldom, if ever, now made, owing to the effective, if not so speedy, remedy which is provided in the ordinary police and criminal processes for the apprehension and punishment of offenders. Justices of the peace are either appointed for particular counties or for boroughs. The former have been usually only appointed on the recommendation of the Lord-Lieutenants of the counties, the propriety of which has been recently debated in Parliament.

Justin Martyr, a Christian father of the second century, was born at Flavia Neapolis, now Nábulus, in Palestine. His parents appear to have been heathens. He himself was first a Stoic, then a Peripatetic, then a Pythagorean, and finally a Christian Platonist. Nothing is known of his life except what he himself tells, according to which he disputed at Ephesus with a Jew named Trypho, and at Rome with Crescens, a Cynic. Eusebius says that Justin owed his death to the hatred of the latter. His martyrdom was probably between

148 and 165, but the date of his birth cannot be fixed. The account of his death is derived from an old document of unknown authorship. Many writings are attributed to Justin, but very few are undoubtedly genuine. Of these the *First Apology* was dedicated to the Emperor Antoninus Pius. He defended the general position of the Christians rather than their particular doctrines.

Justinian I. (FLAVIUS ANICIUS JUSTINIANUS), Roman Emperor, was born in Illyricum about the year 483. His original name was Uprauda. He was educated in Constantinople, and adopted by his uncle, Justin I., who in the year of his death (527) associated him with himself in the empire. The great work of his reign was the so-called codification of the laws. By the *Codex Constitutionum* issued in 529, the statute law, consisting of the decrees, edicts, rescripts, etc., of the emperors were reduced and brought into order; and in 533 the *Digest* or *Pandects* gave a selection of extracts from Ulpian, Paulus, and some thirty of the other great jurists, no less than two thousand treatises having been consulted. By these all former statutes and legal opinions were abrogated. An elementary manual containing an outline of the laws based upon the *Commentarii* of Gaius, and known as the *Institutes of Justinian*, was also prepared; and in 534 a revised *Codex* was issued, this being the one now in use. In this work Tribonian had been the chief adviser of the emperor, and by him much of the work itself was done. The *Novellae Constitutiones*, or "Novels," embodying the decrees made in Justinian's own reign, completed the immense legal work, which is known in its entirety as the *Corpus Juris Civilis*. All but the "Novels" were published in Greek.

Foreign wars and theological strifes occupied the rest of Justinian's attention. As a theologian the emperor was orthodox, and was active in his suppression both of heathens and heretics. Under the influence of his wife, Theodora, however, he ultimately became involved in a species of Monophysitism, for holding which heresy he had deprived several bishops. He summoned Pope Vigilius to Constantinople in order to induce him to condemn certain writers of the orthodox party who were tinged with Nestorianism, and ejected Eutychius, the Patriarch of Constantinople, for resisting his views. He became involved in wars on account of his persecutions of the Montanists in Phrygia and the Samaritans; and by closing the schools at Athens drove the professors to the Persian Court. War with Chosroes, King of Persia, continued for twenty-two years, at the end of which the empire was weakened, and had to pay a tribute in exchange for the possession of Lazica. On the other hand, by the generalship of Belisarius (q.v.), northern Africa and southern Spain were reconquered from the Vandals, and the kingdom of the Ostrogoths in Italy was overthrown. In 536 Rome was taken, and when a revival of the Ostrogoths under Totila had shaken the imperial administration, Narses was despatched in 552 with a fresh army, by which the barbarian was defeated and slain at Taginae. Italy was reunited to the empire. Notwithstanding

these successes on the borders of the empire, the barbarians of the north were allowed to make frequent incursions, and sometimes to appear even under the walls of Constantinople.

In his administration Justinian had an eye to men of ability, but was not scrupulous as to their character and proceedings, so long as they served him well. Heavy taxes were imposed not only for the wars, but for the purpose of building, of which the emperor was very fond. The Church of St. Sophia (now a mosque) and that of Little St. Sophia (originally Saints Sergius and Bacchus) are memorials of his magnificence in this direction. During this reign the dignity of the consulship was abolished; and since the large expenses which its bearer was expected to support were defrayed by the state, a great economy was effected. Justinian himself was a man of great activity and talent, but fell short of being a great man, though he approached nearer to it than any other Eastern emperor. He had a great passion for theology; but it is unknown to what extent he took part in the great legal work of his reign. He was much under the influence of his wife. He died in 565, after a reign of thirty-eight years, and having no children, was succeeded by his nephew, Justin II.

Jute, the fibre of the two closely-related species *Corchorus capsularis* and *C. olitorius*, tall annual herbaceous plants belonging to the order Tiliaceæ, and native to Bengal, which is also almost the sole seat of their cultivation. They are grown in a hot climate with an abundant rainfall and in rich, well-manured alluvial soil, and the stalks are cut between August and October, preferably when the plants are in flower. The cost of cultivation ranges from 3s. to 52s. per acre, and the produce from 5 cwts. to 30 cwts. The fibre is obtained by a retting process, as in the case of flax and hemp (q.v.), and is 6, 7, or even 14 feet long, the finest being yellowish white, and having a silky lustre. It is more woody than either flax or hemp, and, though readily dyed, cannot easily be bleached to a pure white. It is exported from Calcutta in bales of 400 lbs. each, nine-tenths of that exported in the raw state coming to British ports. The exportation has grown from 18 tons valued at £62 in 1829, and nearly 1,200 tons in 1832, to over 180,000 tons in 1869, and over 527,000 tons in 1889. Jute is manufactured by the Hindoos into string, cord, paper, gunny-cloth and gunny-bags. The coarse sacking known as gunny-cloth was formerly made by hand; but there are now twenty-seven jute-mills with power-looms in Bengal, and they worked up 187,700 tons of jute in 1890, the exportation of gunny-cloth now amounting to 15,000,000 yards. Gunny-bags were only first exported in 1883, but nearly 100,000,000 are now annually exported, chiefly to the United States and Australia. They are used for wool-packs and to hold salt, corn, and other seeds, and, when worn out, for paper-making. The failure of the supply of Russian hemp and flax during the Crimean War (1854-56), and of American cotton during the Civil War of 1861-63, established the manufacture of jute at Dundee, which is still the chief centre, though there are also factories at Glasgow, Aberdeen, and

Barrow-in-Furness, and in Ireland. There are now 120 jute factories in the United Kingdom, with 12,000 power-looms, and employing over 40,000 hands. Jute manufactures to the value of over £2,665,000 were exported from the United Kingdom in 1890. This large manufacture has been mainly rendered possible by a process of softening the jute with oil and water. Otherwise it is spun in much the same manner as flax. It is used for sacking, tarpaulins, backing for floor-cloth, carpets, and rugs; as an adulterant of silk, and as an imitation hair in stage-wigs.

Jutland, a thinly peopled peninsula situated between the North Sea, the Baltic, and Germany. Its greatest breadth is upwards of 100 miles, and it is 300 miles in length. A low ridge of chalk hills run through it from south to north. It has formed part of Denmark since the 10th century, the Jutes having been previously its inhabitants.

Juvenal (DECIMUS JUNIUS JUVENALIS), the great Roman satirist, is supposed to have been born at Aquinum, the son of a freedman, probably in the reign of Claudius. He seems to have been in easy circumstances, and had had a good training in rhetoric. Some accounts say that he was banished to Egypt for having given offence by some lines originally written against the actor Paris, the favourite of Domitian, but by what emperor is quite uncertain. In an inscription found at Aquinum, recording the dedication of an altar to Ceres by a Junius Juvenalis, the latter is called "duumvir quinquennalis" and "flamen divi Vespasiani." Internal evidence points to the fact that the Satires were composed between 100 A.D. and 130 A.D. in the reigns of Trajan and Hadrian. They are generally held, however, to portray the state of society under Domitian. Of the sixteen Satires, the third (imitated by Johnson in his *London*), the tenth, and the sixth (against the female sex), are the most celebrated. The fourth is political rather than social. Juvenal was a friend of Martial, and a contemporary of Tacitus and the younger Pliny. He has an unrivalled power of invective, but is without the restraint of the great historian, or the imagination of a poet, or the urbanity of a Horace. His gift is rather rhetorical than poetical. Among the best editions of Juvenal are those of Otto Jahn, J. B. Mayor, and Lewis.

Juvenile Offenders. When children apparently under twelve years of age, or between the ages of twelve and sixteen years, are brought before justices charged with offences, the justices have power under the "Summary Jurisdiction Act, 1879," to deal summarily with such cases instead of committing the offenders to take their trial at the assizes or sessions. The justices are also empowered to send such offenders to a reformatory school for a certain fixed period, not less than two or more than five years.

Juxon, WILLIAM (1582-1663), Archbishop of Canterbury, was born at Chichester and educated at Merchant Taylors' and St. John's College, Oxford, of which he became president in 1621. He had previously held the benefices of St. Giles, Oxford,

and Somerton in the same county. He became successively Dean of Worcester, Bishop of Hereford, and Primate, this last after the restoration. In 1641 he resigned the office of Lord High Treasurer, which he had held for six years with credit if not with distinction. He was with Charles I. at his execution, and is perhaps best known to posterity as having been addressed with the mysterious "Remember!" by that unfortunate sovereign. He owed his rise to the friendship of Laud.

K

K, k, the eleventh letter in the English alphabet, derived from the Egyptian hieroglyphics of a bowl, called Kaph by the Phœnicians, and then by the Greeks Kappa; it was only used in Latin in Kalendæ and proper names, and therefore does not appear in Romance alphabets. This letter represents the sound of the back palatal voiceless stop or explosive formerly called the hard guttural mute. It is used for this sound in Modern English in words of early English or Romance origin before *e*, *i*, and *n*. It is never doubled, but is used with *c* for double *c* and double *k*. It is also used in the writing of the middle ages as a numeral for 250.

Kaaba, or CAABA, the name given to the Mohammedan mosque at Mecca, and sometimes to the small oratory within it, containing a black stone said to have been given by the angel to Abraham.

Kababish, *i.e.* "Goatherd," a large Arab tribe, East Sudan, chiefly along the west bank of the White Nile between 12° to 15° N. lat., and on the steppes bordering the caravan route running from Kordofan to the Nile at Dongola. They are akin but often hostile to the *Bakkara* ("Cowherds"), who dwell further south and along the Bahr el-Arab nearly to its source. Both are fanatical Mohammedans, hunters and robbers, devoting most of their energies to slave-raiding and plundering expeditions. Before the Mahdist revolt (1882) the Kababish were estimated at 60,000, divided into about forty sub-tribes. (Parkyns, *The Kubbabish Arabs; Journal of the Royal Geographical Society*, xx., p. 254.)

Kabards, a historical people of Central Caucasus (Great and Little Kabarda), said to have been originally Khazars, but through long alliances with the Circassians now completely assimilated to the Caucasian type of which they are at present the finest representatives; tall, handsome, with extremely regular features, haughty expression, and martial bearing, hence largely recruited for the household troops of the Czar; the superb "Cherkesses," mounting guard at the Winter Palace, Petersburg, are mostly Kabards. All are Mohammedans, except a small group which in 1763 became nominal Christians, and settled in the northern steppe about the middle course of the Terek. An opposite movement took place towards the beginning of the present century, when some 40,000, to escape from Russian oppression, took refuge with the Turks of the Kuban basin, where many of their descendants

still survive. The *Kabertai*, as they call themselves, speak one of the numerous stock languages of the Caucasus, noted for its harsh, guttural, and hissing sounds. At present the full-blood Kabards number altogether little over 30,000.

Kábul. [CABUL.]

Kabyles (Arab. *qabîl* = "tribe;" plural *qabâil*), the collective name of one of the chief divisions of the Berber race [BERBERS], who occupy the coast ranges and tablelands of Mauritania, and who call themselves Imazighen. Unlike the Arab nomads, the Kabyles are chiefly peasantry settled in villages with a communal organisation administered by an *amîr*, whose office is elective and not hereditary like that of the Arab sheikh. In Algeria there are as many as 120 distinct tribes grouped in *thakebilt* ("confederacies"), some of which, such as the Ait-Îrâten, the Igawawen (Zwawas, whence the French Zouaves), the Gueshtulas, and others, are of great antiquity, and were formerly very powerful. At present they number from 450,000 to 500,000 souls, all Mohammedans, but of a less fanatical type than their Arab neighbours. Since 1850 the Algerian Kabyles have been subject to France, while those of Morocco are for the most part still semi-independent, often revolting against the Sultan's authority, and paying tribute only under compulsion.

Kachari, a large Tibeto-Burman people, Goalpara and Garo districts, West Assam; seven main divisions: Hojai with Lalong, Mech, Koch, Rabha, Chutia, Tipperah, and Garo, all except the Garo more or less Hinduised; total population about 230,000. The original national name is *Bodo*; but those who have adopted the Hindu religion call themselves *Soronia*, *i.e.* "Purified." Some of their tribes are scattered over north-east Bengal as far as the Terai district, Nepal, where they take the name of *Mechi*. Kachari appears to be mainly restricted to the Assamese branch, who are a vigorous, industrious people, trustworthy and honest, altogether superior physically and morally to the average Bengalese peasantry. The primitive Kachari language is regarded by Hodgson as of a Dravidian type in its general structure. (Rev. S. Endle, *Outline of the Kachari Language*, 1885; G. H. Damant, *Journal of the Asiatic Society*, April, 1880.) The Kachari were subdued by the Burmese in the first quarter of the present century; but the Burmese were expelled in 1826 by the English, who restored their raja, and on his death in 1830 annexed the kingdom to the Bengal Presidency.

Kachinzes, a Tatar people of South Siberia, along the right bank of the Upper Yenisei between the Bielaia-Yussa and Abakan confluences. Since their reduction by the Russians, they have become nominal Christians and monogamists. Formerly great hunters, they are now occupied chiefly with stock-breeding, and own considerable numbers of horses, cattle, and sheep. The Kachinzes are one of the few Siberian tribes who are not dying out, having increased from about 1,000 at the end of the 18th century to over 7,000 in 1890. (Strumpell, *Die Katschinzen*, in *Mittheilungen* of the Leipzig Geographical Society, 1875.)

Kader, a low-caste tribe, Anamally Hills, Coimbatore, South India, one of the purest representatives of the aboriginal Negrito element, nearly black, with wavy hair and frizzly beard, hence quite distinct in type from the Dravidians, although they now speak a Malayalim (Dravidian) dialect. (Emil Schlagintweit, *Indien in Wort und Bild*.)

Kaffa, or **FEODOSIA**, a Russian seaport on the S.E. coast of the Crimea. It was founded in the 6th century B.C., under the name of Theodosia, by a body of Greek colonists from Ionia. During the Middle Ages it belonged to the Genoese, and formed an important depôt for Eastern goods. In 1474 it was captured by the Turks. Under their rule it carried on a thriving trade in Russian and Polish slaves, but in 1792 it fell into the hands of the Russians. Soap, caviare, and camel-hair carpets are manufactured.

Kafir (Arab. *Kāfir*, plural *Kufra*—"infidel," "unbeliever"), originally a term of contempt applied by Mohammedans to all pagan peoples who reject the tenets of the Koran; hence there are "Kafirs" in Asia (the Siah Posh of Kafiristan) and in North Africa (the heathen Tibbus from whom the Kufra Oasis was named). When the Portuguese penetrated into the Indian Ocean, they found the word, which they wrote "Caffre," current amongst the Arabs of Sofala and Zanzibar, with special reference to the pagan Negroid populations of the east coast. In this more restricted sense it passed from the Portuguese to the English, who have always applied it almost exclusively to the heathen peoples with whom they came in contact on the south-east seaboard (Caffraria, Kafirland) after their occupation of Cape Colony. The true name of most of these Kafirs is Ama-Xosa (Ama-Khosa), and they form, with their northern neighbours, the Ama-Zulu, a distinct and important division of the Bantu family. [ZULU-XOSA.]

Kafiristan ("Land of Unbelievers"), a little-known region on the N.W. frontier of India, inhabited by an Aryan race (Siáhposh), who speak a language akin to Sanskrit, and worship one Supreme Being (Imbra). The country, which is bounded on the W. and S. by Afghanistan, is intersected by numerous ridges, from 11,000 to 17,000 feet in height, mostly running from the Hindu Kush range on the N.W. The various tribes occupying the valleys between these are not apparently bound together by any political tie. The best authenticated accounts represent the Siáhposh Káfirs as bold, robust, undersized, jovial, and fond of amusement.

Kagoshima, a town in the S.E. of Kiusiu Island, Japan, on a gulf of the same name.

Kahtanides, one of the fundamental divisions of the Arab race—the settled as opposed to the Bedouin or nomad element—form the bulk of the population of Yemen (Arabia Felix), and claim descent from Kahtan, the Joktan, son of Heber (Genesis x. 25). From a legendary Himyar, grandson of Kahtan, they took the name of Himyarites, the Homerites of Greek writers [HIMYARITES]; but with the adoption of Islam they gradually laid aside their old Himyaritic speech, and now speak

the Koreish, or classical Arabic of the Koran. Though now much mixed with black blood through the female slaves imported from Africa, the Kahtanides are still regarded as the elder and purer branch of the race; hence are known as Arab el-Ariba, i.e. "Arabs of the Arabs."

Kai-fung, capital of the Chinese Province of Honan, about three miles S. of the Yellow River. For more than three centuries it has been the residence of numerous Jews. A disastrous flood took place here in 1887.

Kainite, a mineral of a white to flesh colour, found largely in the great deposits at Stassfurt. It consists of the sulphate of magnesium, chloride of potassium, and water. It is easily soluble in water. The crystals belong to the monoclinic system, and usually form pyramids or tablets.

Kairwan, an ancient town of Tunis, situated on an extensive plain, 80 miles S. of the capital. It was founded by the Saracen General, Okba, about 670, and became the chief seat of the Arabic dominion in Western Africa. The mosque built by Okba remains.

Kaiserslautern, a walled town in the Bavarian Palatinate on the Lautern, 52 miles S.W. of Worms. The manufactures include tissues, yarn, sewing-machines, and iron wares.

Kaithal, an ancient town in Karnál District, Punjab, 93 miles N.N.W. of Delhi.

Kajars, a Turkoman tribe of North Persia, of which since 1794 the reigning family is a member; seven original divisions long scattered over Asia Minor and Syria, but settled chiefly in Persia since the invasion of Jenghis Khan (1222). Most of the Kajars are now merged in the settled populations of Khorasan, but those of Asterabad still maintain a separate tribal organisation, being grouped in two branches, Ashaki-Bashi and Ynkari-Bashi, each with six sub-groups.

Kaka, the New Zealand name for parrots of the genus *Nestor*, the single species of which (*N. meridionalis*) varies considerably. One form (*N. notabilis*) is remarkable for its change from insectivorous to flesh-eating habits. The general plumage is olive-brown, with the crown light grey and the under surface crimson. *N. productus*, the Port Phillip *Nestor*, is extinct.

Kakanda, a Negro people of Central Sudan, along the right bank of the Niger north of the Benue confluence. Being well armed with rifles, and owning many boats, the Kakandas control the trade of the Middle Niger. Before the establishment of the British Royal Niger Company, they dealt chiefly in slaves and ivory, which they bartered for firearms, salt, and manufactured goods. Their relations extended as far as the Hausa states of Yakoba and Kano, and they traded even with the merchants of Ghadames on the Tunis frontier. (Rohlf.)

Kakapo (*Stringops habroptilus*), the Owl, or Ground Parrot, a native of New Zealand, in danger of extermination, because its flesh is esteemed a delicacy, and, though possessing large wings, it is

unable to fly. The first English popular name refers to its nocturnal, and the second to its burrowing, habits. It is about 24 inches long, and the soft plumage is green mottled with brown and yellow.

Kakar, a large division of the Afghan people, between the Ghilzaes and Baluchistan N. and S., and conterminous on the W. with the Waziri. Since 1881 Yaghistan ("Free Land"), as they call their territory, has been brought within the advanced frontier of British India towards Candahar. The Kakars are not the fierce and bellicose hillmen that they have been represented, but, on the contrary, peaceful pastoral nomads, who encamp in small groups of three or four families under their *kizhdi* (black tents), and some of whom take part in the caravan trade between Herat and India. All are Mohammedans, and speak a Pushtu (Afghan) dialect, although doubts have been thrown on their Afghan origin, some affiliating them to the Turki race, others regarding them as fundamentally Rajputs or perhaps Jats. There are two detached groups, the *Gaduns* of the Mahaban and Chach valleys north of Attock, and the *Taimani Char-Aimak* of the Ghor Mountains, both of whom claim to be pure Kakars. Of the Kakars proper there are nine main divisions: Jala, Musa, Kadi, Usman, Khidar, Abdula, Kabi, Hamza, Shabo, with whom Elphinstone includes the Sanatials; total population, about 200,000.

Kakhyens (CHINS), collective name of numerous hill tribes about the Burma-Chinese frontiers, Upper Irawady basin above Bhamo. They call themselves Singpho (Chingpaw), *i.e.* "Men;" but there are a great number of tribal names comprised in their four chief divisions: Maru, Adzi, Lishoni, and Tashons. These last, who are said to muster as many as 10,000 fighting men, are the most powerful of all, and gave great trouble to the English in the border warfare that broke out after the annexation of Upper Burma; but they were at last reduced, together with their Yahan neighbours, in 1892. The Kakhyens are generally grouped with the Tibeto-Burman family, but they appear to be a very mixed people, amongst whom two types predominate: (1) The true Singpho, with short round head, low forehead, prominent jaws, oblique eyes, broad nose, thick protruding lips, dark brown hair and eyes, dirty buff complexion, low stature (5 feet to 5 feet 4 inches), very short legs. (2) Regular features, long oval face, pointed chin, aquiline nose, fair colour, often almost white. The language is monosyllabic, entirely distinct from Burmese, and showing a great resemblance to the Mishmi and Abor of North Assam. (Dr. J. Anderson, *Mandelay to Momien*, 1876.)

Kalahari Desert, a vast plain in S. Africa, lying between the two great plateau systems on the E. and W., and extending from 21° to 28° S. lat. The general elevation is about 3,500 feet. Game is abundant, and in most parts it is covered with vegetation throughout the year. The Bakalahari, who, with a few Bushmen, form the inhabitants, are to some extent an agricultural people.

Kalamazoo, a thriving town on the River Kalamazoo, Michigan, U.S., 100 miles N.E. of Chicago.

Kaleidoscope is the name of an instrument invented by Sir David Brewster (1817) for "seeing beautiful pictures." It consists of two mirrors placed at an angle which is an even submultiple of 360° in a cylinder at one end of which is an eye-glass and at the other an object box formed by two glasses, between which are placed pieces of variously coloured glass. By turning the cylinder a countless number of pictures may be obtained.

Kalgan, a Chinese town on the Great Wall, in the province of Chihli, 110 miles N.W. of Peking. The *tutung* governing the Tsakhar tribe of Mongols to the N. of the wall resides here. It is one of the chief places on the trade route through Mongolia.

Kálidása, a famous Indian poet, whose great drama *Sákuntala* ("The Lost Ring") has been translated by Sir William Jones (1789) and Sir Monier Williams (1855). His date is extremely doubtful, but it seems probable that he lived in the 6th century A.D.

Kalinjar, a town and hill-fort of great antiquity in the N.W. Provinces of India, standing on a rocky and isolated hill, 1,230 feet in height, 33 miles S. of Banda. Its records date back to a prehistoric period, and it is rich in architectural remains, including the ruins of the magnificent temple of Nál Kantha Mahádeo.

Kalisz, a town of Prussian Poland, capital of a government of the same name, 132 miles W.S.W. of Warsaw. It is situated on the Prosna, near the German frontier. In the neighbourhood the Swedes were defeated by Augustus, King of Poland, in 1706.

Kalkas (KHALKAS), a main branch of the eastern Mongolians, stretching along the northern fringe of the Gobi Desert from Manchuria to Zungaria; are typical Mongols, with broad flat face, high cheek-bones, wide nostrils, small narrow eyes, large ears, coarse black and lank hair, scanty beard, dirty yellow sunburnt complexion, stout thick-set figure rather above the average height; speech differs considerably from that current amongst the southern Mongols. All are Buddhists subject to China since 1691. They comprise four *aimaks* (principalities) and 86 *koshungs* (banners), each under a hereditary khan (prince), who is responsible to the Peking Government for the taxes and the maintenance of order; population 400,000 to 500,000, all tent-dwellers, shifting their camping-grounds with the seasons.

Kallima, a genus of butterflies, popularly known as the "Dead Leaf Butterflies," owing to their striking resemblance to a dead leaf; the most notable cases occur in the East Indies. The resemblance is of value for protective purposes, as the insects are overlooked by birds. [MIMICRY.]

Kalmar, or CALMAR, a Swedish seaport, on an island in the Sound of Kalmar, between the mainland and the island of Öland. There is a fine

cathedral, and the ancient castle was the scene of many historic events. Kalmar carries on a large trade, especially in timber, and has manufactures of tobacco and matches.

Kalmia, a North American genus of evergreen shrubs belonging to the heath tribe, named by Linnaeus after his pupil Kalm, who travelled in America. The genus contains several species, and has very beautiful chalice-shaped flowers with the stamens in small pouches. Some of them are said to yield poisonous honey, and the leaves, shoots, and berries of several species are also poisonous.

Kalmuks, the western Mongols, of whom there are seven main divisions: *Tanghut*, in the valley of like name; *Olot* (*Eleat*), in Ila district; *Turgut*, in Ila, Yulduz, Karashahr and Lake Lob districts; *Koshot* (*Choshod*), in Yulduz; *Kara Kalmuk* ("Black Kalmuks"), in Chanchan, North Tibet, and Lake Lob; *Sarigh Kalmuk*, in Turfan, Urumchi, and Yulduz; *Tuwat*, in Tibet. All are Buddhists and nomads, divided into numerous sub-groups under *noyuns* (chiefs), who are collectively ruled by the *ghaldan* (khan or prince). It was the Turgut Kalmuks who, to escape from the tyranny of the Zungars, migrated in 1636 to the Lower Volga, where some still survive in the government of Astrakhan. But after the destruction of the Zungars by the Chinese in 1756 the majority (350,000) returned (1771) through the Kirghiz steppes to their old homes, losing half their number on their way. At present the Kalmuk nation numbers altogether about 1,000,000 souls, of whom 160,000 are in Russia, the rest in China (Mongolia and North Tibet). In physical appearance, language, and usages they differ little from the Kalkas and other eastern Mongols. [MONGOLS.]

Kalná, a town of Bengal, on the Bhagirathi, 47 miles N. of Calcutta. It imports large quantities of rice.

Kalocsa, a town of Hungary, near the Danube, 86 miles S. of Pesth by railway. It is the seat of an archbishop, and has a fine cathedral.

Kalong (*Pteropus edulis*), one of the largest of the Fruit-bats. [BAT.]

Kalpi, a town in the N.W. Provinces, India, situated amidst rocky ravines beside the Jumna, 50 miles S.W. of Cawnpore. During the Mogul period it played a conspicuous part in the history of India. In 1858 a body of 12,000 rebels was defeated here by Sir Hugh Rose, afterwards Lord Strathmairn.

Kaluga, a town of Central Russia, capital of a government of the same name, 188 miles S.S.W. of Moscow. A trade in corn is carried on by means of the river Oka. The town is noted for its cakes, and has also leather and other manufactures. There is a large iron trade, and horses are reared on the plains in the neighbourhood.

Kama, the chief tributary of the Volga, 1,050 miles in length, has a very irregular course. Rising in the E. of the government of Viatka, it flows N.W., N.E., E., S.E., S., and finally S.W., joining the Volga 43 miles below Kazan. It is navigable from this point to Perm, a distance of 930 miles.

Kamala, or WARS, a red powder formed of the glands on the capsules of *Mallotus philippinensis*, a small euphorbiaceous tree which is found from the Philippines and North Australia to Arabia. Kamala has long been used in India as an anthelmintic, and was added to the British pharmacopœia in 1864. It is also used in India, with boiling carbonate of soda, to dye silk of a fine orange colour.

Kamchadales, the primitive inhabitants of Kamchatka, now confined to the central and southern districts, and even here much mixed with the Russian colonists. The *Itelmen*, i.e. "Aborigines," as they call themselves, are grouped in three main divisions, now reduced to less than 5,000, of whom 3,000 are full-blood, the rest half-castes. They are a short, thick-set people, with long face, slightly prominent cheek-bones, flat nose, small sparkling eyes, yellowish colour, long black hair. The language is quite distinct from that of the neighbouring Koriaks, and shows no affinity to any other known Siberian tongue, the relations being expressed not by suffixes, but by prefixes attached to the unmodified roots. The vocabulary is extremely poor, there being but one word for the sun and moon, while birds and fishes are named from the months when they most abound. The Kamchadales are essentially hunters and fishers, living in pile dwellings (*balangan*) in summer, and in underground houses entered through a hole in the roof in winter. They are a gentle, long-suffering people, although driven to revolt in 1731 and 1740 against the intolerable oppression of their Russian taskmasters. Formerly Shamanists, most of them are now at least nominal Christians ("Orthodox Greeks"). (G. Kennan, *Tent Life in Siberia and Adventures amongst the Koraks and other Tribes in Kamchatka* (1871).

Kamchatka, or KAMTSCHATKA, a peninsula of Siberia, on the E. coast of Asia, between 51° and 62° N. lat. It extends into the N. Pacific Ocean, between the Sea of Okhotsk on the W. and that of Kamchatka on the E., and is 870 miles long, with a mean breadth of 180 miles; the area is 465,690 square miles. A range of mountains runs from N. to S., containing Klochevskaia (16,988 feet) and other active volcanoes. The climate is cold, especially on the E. coast, but, owing to the abundant moisture, grasses and trees grow luxuriantly. The inhabitants are chiefly engaged in fishing, and the pursuit of the fur-bearing animals in which the peninsula abounds. Kamchatka was incorporated in the Russian Empire in the latter part of the 17th century. The capital, Petropaulovski, is on the S.E. coast.

Kamenetz-Podolsk, capital of the Russian Government of Podolia, stands on the Smotritza, near its junction with the Dniester. The Roman Catholic cathedral dates from the 14th century, the Greek cathedral from the 16th century.

Kames, HENRY HOME, LORD (1696-1782), a Scotch judge and philosopher, was born in Berwickshire. In 1752 he was called to the bench under the title of Lord Kames. His chief work was his *Essays on the Principles of Morality and Natural Religion* (1751).

Kampen, a small Dutch port in the province of Overijssel, near the mouth of the Yssel, $5\frac{1}{2}$ miles N.W. of Zwolle by railway. It was a member of the Hanseatic League, and retains a fine mediæval church, dedicated to St. Nicholas.

Kámthi, or KAMPTI, a large town and cantonment on the Kanhan, Central Provinces, India, 9 miles N.E. of Nagpur. There is a trade in cattle, salt, grain, and timber.

Kanaka, a term applied by Europeans indiscriminately to all the South Sea Islanders, though it should properly be restricted to the eastern Polynesians, in whose language it has the meaning of "Men." Kanaka is the Hawaiian form of the word, the other chief dialectic variants being *Tangata* (Tonga group and Maori of New Zealand), *Tuata* (Tahiti), *Kenata*, *Kenana*, and *Enana* (Marquesas). In all these dialects the word is used to indicate the natives themselves in contradistinction to the *Haoë*, i.e. strangers of all kinds, whites, blacks, and half-castes. At present *Kanaka* is applied more especially to the natives pressed into the service of the planters in Queensland, New Caledonia, and Fiji; it thus corresponds in the Pacific waters to the *Coolie* of the Indian Ocean.

Kananj, an ancient city in the N.W. Provinces of India, situated on the Kálí Nadi, 5 miles above its union with the Ganges, and 32 miles S. of Fatehgarh. It was once the capital of a great Aryan kingdom, and reached the zenith of its power about 500 A.D.

Kanara, NORTH and SOUTH, two districts on the S.W. coast of India. The former is in the presidency of Bombay, the latter, adjoining it, in that of Madras; their area is 3,911 and 3,902 square miles respectively. North Kanara is traversed by ridges of the Western Gháts, which form the E. boundary of South Kanara. In both there are vast tracts of forest. Mangalore is the chief town.

Kanaris, CONSTANTINE (1785–1877), a Greek patriot who distinguished himself by his naval services during the War of Independence (1822–24). He became Minister of Marine in 1848, led the Coalition Ministry of 1848–49, and again held office in 1854–55, 1862, 1864, and 1877.

Kandahar, the capital of the province of the same name in S.E. Afghanistan, is situated on a fertile plain 318 miles S.W. of Kabul. It is irregularly oblong in form, and is surrounded by a mud wall 27 feet high and nearly 4 miles in circuit. At the point where the two main streets intersect there is a large dome 50 yards in diameter. The houses are mostly constructed of sun-dried bricks; they have flat roofs and, in some cases, upperstoreys. The trade with the neighbouring regions is carried on chiefly by Persian merchants. Kandahar is said to have been originally founded by Alexander the Great; the present town was founded in 1747 by Ahmad Shah Abdali. It was occupied by British troops in the war of 1878–80.

Kandy, a town of Ceylon, 74 miles N.E. of Colombo. It is situated on a wide plain near a

small lake about 1,670 feet above the sea. The famous tooth of Buddha is preserved in a temple in the town.

Kane, ELISHA KENT (1822–57), American explorer, born in Pennsylvania, entered the United States navy as assistant-surgeon, and accompanied the first Grinnell Expedition in search of Franklin (1850–52) as surgeon and naturalist. He commanded the second Grinnell Expedition (1853), and was only rescued by a relief party after an absence of three years. He published accounts of both expeditions.

Kane, SIR ROBERT (1810–90), a celebrated Irish chemist, founder and director of the Museum of Industry in Ireland, and for many years President of Queen's College, Cork. He published *Elements of Chemistry* (1842) and other works.

Kanembu, the people of the ancient kingdom of Kanem, and generally of the northern shores of Lake Chad, Central Sudan. They are the southernmost branch of the Tibbus of Tibesti (Central Saharan Highlands), as indicated by the name itself, which in the Tibbu language means "Southerners," from *Kanem* = "the south," and *bu* = "people;" but in this region they have become much mixed with the indigenous Negro populations, so that the Kanembu are now a Negroid people intermediate between the Hamitic Tibbus and the Sudanese blacks. The language also is intermediate between the northern Tibbu and the Kanuri of Bornu. The Kanembu are an historical people, who gave more than one dynasty to Bornu, and whose written and oral records go back to a legendary Sef, founder of a kingdom which in pagan times "ruled over the Berbers, the Tibbus, the Kanembu, and others." The people, or at least their rulers, have been Mohammedans since the 11th century, and, according to Nachtigal (*Sahara und Sudan*, vol. ii.), they number at present about 100,000, including some Arab, Bornu, and other settlers.

Kangaroo, any individual of the marsupial family Macropodidæ (with about fifty species), almost exclusively confined to Australia and Tasmania, with some representatives in the Papuan Islands. The fore limbs are small, and used chiefly for prehension, the hind limbs are enormously developed; there is no great toe, the second and third are slender and united in a common skin, the fourth and fifth are very long, and form the principal support of the body, aided by the great stout tail. The general method of progression is a series of enormous bounds. They feed chiefly on grass, and do great damage to pasture land. The flesh is eaten, and the skin tanned into leather. In disposition they are timid and inoffensive, but when provoked or brought to bay they are formidable opponents, and will seize a man and wound him terribly, and sometimes fatally, with the terrible claws of the hind limbs. They differ greatly in size, the Giant Kangaroo (*Macropus giganteus*) being about eight feet long, including the tail, while the Kangaroo Rats (*Hypsiprymnus*) are no bigger than a hare. The Rock Kangaroos (*Petrogale*) are so called from the situation they frequent; and the Tree Kangaroos (*Dendrolagus*), from New Guinea, are arboreal.



KANGAROOS.

1 Skeleton of Great Kangaroo. 2 Teeth of Great Kangaroo. 3 Brain of Great Kangaroo. 4 Tree Kangaroo. 5 Great Kangaroo. 6 Kangaroo Rat. 7 Rock Kangaroos.

Kano, a Negro town in the state of Sokoto, 12° N. lat., 9° E. long. The inhabitants are chiefly engaged in weaving and dyeing cloth.

Kansas, a river of the U.S. formed by the union of the Republican and Smoky Hill Forks, which rise at the E. foot of the Rocky Mountains. From this point it flows 120 miles E. to the Missouri a little above Kansas City. The total length is 500 miles.

Kansas, one of the United States of America, lies between 37° and 40° N. lat. and 94° 38' and 102° W. long. It is bounded by Nebraska on the N., Colorado on the W., Missouri on the E., and Indian Territory on the S. The length from E. to W. is about 400 miles, the breadth 210 miles, and the area 82,080 square miles. The surface is a rolling prairie, rising by imperceptible degrees from about 800 feet on the E. border to 3,000 feet or 4,000 feet in the N.W. The Missouri, which skirts the state on the N.E., is the only navigable river. The S. portion of the state is drained by the Arkansas and its affluents, the N. portion by the Kansas, and its head streams, the Republican Fork and the Smoky Hill Fork. Although extremes of heat and cold sometimes occur, the climate is on the whole equable, the temperature averaging 53° Fahr. annually, and the weather is generally clear and bright. The E. part of the state is one vast coalfield; there are extensive beds of rock-salt, and lead and zinc are found in large quantities in the S.E.; Kansas is also noted for its good building-stones, including the "Leavenworth marble," "Permian limestone," and several other varieties. The chief industries are agriculture and stock-raising. Nearly one-fifth of the surface is under wheat, maize, and oats. The other industries include the cultivation of sorghum cane and manufacture of sorghum sugar, beef- and pork-packing, and the manufacture of agricultural implements, and there are many flour-mills and foundries. The state contains 106 counties, and is represented by two senators and seven members of Congress. The local legislative and administrative bodies are elected at intervals of two years. For several years after 1854, when Kansas became a territory, a fierce struggle was carried on between the anti-slavery and pro-slavery parties, resulting finally in the victory of the former. It was admitted into the Federal Union in 1861. The capital is Topeka (q.v.).

Kansas City, the name of two contiguous towns on the south bank of the Missouri, 280 miles W. of St. Louis by railway. The larger town is in the state of Missouri; the smaller, which adjoins it on the W. so as to form a suburb, is in that of Kansas. The better streets and the more handsome public buildings and private residences are in the larger town, which covers several steep hills. Several large railways converge at Kansas City, so as to make it a centre for the distribution of agricultural produce, and there are large stock-yards and pork-packing establishments, especially in the Kansas town. Car-wheels, shot, soap, etc., are manufactured.

Kant, IMMANUEL, philosopher, was born at Königsberg, in Prussia, in 1724, and died there in 1804. His father and mother were poor, God-fearing people whose religion was of the Pietistic kind. He was educated in Königsberg at the Collegium Fredericianum, where he came under the influence of F. A. Schultz, and at the university, which he quitted in 1746. The next nine years he passed as domestic tutor in various families in the neighbourhood. Returning to Königsberg as *privat-docent* in 1755, he gave lessons in metaphysics, physics, mathematics, and other subjects, and in 1770 was appointed ordinary professor of logic and metaphysics in the university. His works published before this date were *Thoughts on the True Estimate of Living Forces* (1747), *Theory of the Heavens* (1755), and *Dreams of a Visionary Explained by Dreams of Metaphysics* (1766). His *Form and Principles of the Sensible and the Intelligible World* (1770) is important as containing the complete enunciation of his theories of Time and Space, but it took him much longer to develop his views of the intelligible world, and his monumental work, the *Criticism of Pure Reason*, did not appear until 1781. It was followed by the *Foundation of the Metaphysic of Morals* (1785), the *Criticism of Practical Reason* (1788), the *Criticism of Judgment* (1790), and *Religion within the Boundaries of Mere Reason* (1793). The upshot of Kant's philosophical labours was that by reconciling the opposed views of Idealism and Realism—the one of which denied the existence of matter, the other that of spirit—he made it again possible to construct a system in which each should find its appropriate sphere. He called his philosophy a *criticism* because, instead of proceeding on a dogmatic basis, it endeavoured to determine the character of knowledge, the processes by which man becomes possessed of knowledge, and the limits within which knowledge is possible; and a *transcendental criticism*, because it began by laying down the subjective *a priori* conditions necessarily involved in all experience. Knowledge is based on synthetic *a priori* judgments—synthetic because, unless the predicate gives something not contained in the idea of the subject, nothing is added to what already existed in the mind; and *a priori* because, to be truly valid, they must be necessary and universal, whereas the widest inductions hold good only within the range of experience. The world of sense, as known to us, is composed of elements of two kinds—*material* and *formal*. The former are empirical—*i.e.* they are given in experience, and in regard to them the mind is passive; the latter are pure—*i.e.* they are given by the mind, which, in regard to them, is active. The material element in knowledge consists of sensation or impressions. The formal element is partly furnished by sensibility, partly by understanding: it embraces both the pure *a priori* perceptions of space and time as media in which all empirical perceptions must be embodied, and the pure *a priori* conceptions of quantity, quality, relation, and modality. Under each of these heads three kinds of judgment may be formed, viz.:—Universal, particular, and singular (quantity); affirmative, negative, and limitative

(quality); categorical, hypothetical, and disjunctive (relation); and problematic, assertoric, and apodeictic (modality). These twelve kinds of judgment are based on the twelve "Categories," or primitive intelligible notions, viz.:—Totality, plurality, unity; reality, negation, limitation; substance and accident, cause and effect, community or reciprocity; possibility and impossibility, existence and non-existence, necessity and contingency. An object is brought under a Category by means of the "schematism of the pure understanding," which bridges over the interval between mere sensation and pure thought by introducing the element of time, which partakes of the nature of both. In each case a certain *a priori* rule must be followed. The world of sense, as known through experience, is thus in a large measure the creation of our own minds, and consequently, on the sensuous side, we have no knowledge of the "thing in itself." In passing from the sensible to the supersensible world—from *phenomena* to *noumena*—we leave the domain of Understanding for that of Reason. The judgments of the understanding are valid, because its notions, empty in themselves, are filled with the material given in experience; but, inasmuch as experience is now no longer possible, the *ideas* of reason are void of content—they are *regulative*, not *constitutive*, elements of thought—and afford no basis for the formation of judgments. Hence reason, in formulating principles regarding the supersensible substrate—*e.g.* the *soul* is immortal, the *world* had a beginning in time or the *world* had no beginning in time, *God* exists—steps beyond the limits within which knowledge is possible (in Kantian phraseology, becomes *transcendent*), and the result is mere "paralogisms," "antinomies," and, in the case of the Deity, an empty ideal. We are thus forced to turn to the *regulative* function of the ideas, and this brings us within the domain of practical reason. My conscience presents me with a moral law—a "Categorical Imperative," which I am bound to follow, subordinating to it all the merely animal volitions which spring from desire based on pleasure and pain. The Categorical Imperative, placed as it is beyond the sphere of sense, cannot be directly embodied in a concrete proposition, but in regard to its universal validity it may be formulated thus: Act as if the principle by which you act were by your will to be made a universal law of nature. It must constrain our wills entirely by its own force; we must obey it simply because we respect it, not because we look forward to the pleasure which accompanies right action. The will, therefore, which acts in conformity with the moral law must be autonomous, and this involves the idea of the subject as a free cause. But within the limits of sensuous existence we cannot arrive at the state of perfection demanded by the moral law, and thus the immortality of the soul reappears as a postulate of the Practical Reason. Again, in the world of sense the aim of actions performed in obedience to the moral law must be the happiness of our fellow-men, but we cannot be sure that universal happiness will result from right action unless we believe that the course of the world is directed by a Supreme Intelligence. The ideas, which were proved value-

less from the theoretical standpoint, are thus shown to be part of the equipment which man must possess as a moral agent. We are now confronted with the question, How can there be any connection between the sensible realm of nature and the supersensible realm of freedom? It lies in the very idea of freedom to realise in the world of sense the end presented in its laws, and therefore there must be a principle which unites the supersensible substrate of nature with the supersensible which is involved practically in the conception of freedom. The link is found in the faculty of judgment, which furnishes the *a priori* conception of design as the final cause of sensible existence, and thus bridges the chasm between the phenomenal and the intellectual world.

Kanuri, the dominant people of the kingdom of Bornu, Central Sudan, originally Tibbus (Hamites), but now of distinctly Negroid type, with square coarse features, nearly black complexion, woolly or frizzly hair, angular ungainly figures, altogether contrasting unfavourably both in appearance and moral qualities with their western neighbours, the Hausas. Traditionally they came from the north, and their language (*Manna Kanuri*) is closely connected through that of Kanem with the Daza and Teda (southern and northern Tibbu). There are three distinct varieties: Kanuri proper, current in the province of Gazir; Munio and Nguru, spoken collectively by over half the inhabitants of Bornu, or by about 3,000,000 altogether. All the Kanuri people proper have been Mohammedans for many generations, although pagan practices still largely prevail throughout the southern provinces of Bornu. (Nachtigal, *Sahara und Sudan*, vols. i. and ii.; Barth, *Central Afrikanische Vocabularien*; Koelle, *Kanuri Grammar*.)

Kaolin, the Chinese name of *china-clay*, known in Cornwall as *growan clay*. It is a pure clay (q.v.) or hydrous silicate of alumina, containing, on an average, 46 per cent. of silica, 40 per cent. of alumina, and 14 per cent. of water, and results from the decomposition of white potash-, or soda-, felspar in a granite known in its partly decomposed state as *carclayzite*, from Carclaze, in Cornwall. It was first found in England in the Hensbarrow district by William Cookworthy about 1750, though the "soft growans" containing it had long before been worked for the veins of tinstone that traverse them. The pure clay is freed from the quartz and mica by streams of water and is then dried. It is packed in tierces of half a ton weight, many thousands of which are now produced annually. Being practically infusible, it forms in porcelain manufacture the "bone" of the ware, the more fusible china-stone or *petuntzite* (q.v.) forming the "flesh." The clay is also much used for "loading," or adding weight to, paper, calico, etc. Possibly the *kaolinisation* or decomposition of felspar is partly owing to the presence of fluorine in tourmaline, fluor, or some other mineral, in the rock, and not merely to the action of atmospheric carbon-dioxide and moisture.

Kara (from Tatár, also Turkish, meaning "black"), the name of a number of places in Asia—

among them, of the famous Russian convict settlement, beside a small river, and extending 20 miles along a desolate valley, of the same name, some 300 miles from Chita, the capital of Trans-Baikalia. The mines yield 400 lbs. of gold yearly to the Tsar's private purse. State offenders were sent here largely after the revolutionary activities of 1879. Two of the seven prisons are for "politicals"—men and women. Mr. Kennan (*see his Siberia and the Exile System*) in 1885–86 found some of the prisons in a horrible state of filth. Scurvy, typhus, etc., had a permanent hold; and here, far from the eye of the outer world, the most varied and elaborate brutalities were freely practised, noble and cultured men and women being driven to face the dread alternatives of disease, insanity, and suicide. Particularly tragic is the story of Madame Kavalefskaya, sister of a well-known political economist and wife of a professor of Kiev, and of Madame Hope Sigida, a lady twenty-five years old, wife of a civil officer. Madame Kavalefskaya, separated from her husband and little child and exiled in 1879, became insane, was removed twice and brought a third time to the mines, took part with other women in the sixteen days' hunger-strike after the violent treatment of Madame Kavalskaya, and in November, 1889, after the flogging to death of Madame Sigida, committed suicide, as did two other women and two men, by taking poison. About twenty others who took poison recovered. The few privileges of the "politicals" at Kara have since been revoked, and they are treated as common criminals.

Karagass, a Turki people of South Siberia, where they occupy the northern slopes of the Sayansk range between the Angara river and the headwaters of the Yenisei. Physically the Karagass resemble the neighbouring Kirghiz nomads, although regarded by Castren as originally Samoyedes. Most of them are nominal Christians, but still practise many old Shamanistic rites; some are settled in villages, where they cultivate a little land, but the majority are still hunters and trappers, employed by the Russian traders in procuring the costly furs of animals frequenting the surrounding forests.

Karaites, the Jews of the Crimea, where they have been settled from time immemorial; they form a distinct sect, which is distinguished by its close adherence to the text of Pentateuch and its rejection of the Talmud. By some authorities the Karaites are regarded, not as Jews originally, but as descendants of the Tatar *Khazars*, who were converted to the Jewish religion in the 7th century. This view is confirmed by the fact that certain Hebrew inscriptions discovered in the Crimea, and dating from the 8th century, bear distinctly Nogai-Tatar names, such as *Toktamish*, a name which could never have been borne by a true descendant of Abraham or Jacob. Karaite is derived from the Hebrew word *Kara*, "to read," because, so to say, they "read" nothing but the Old Testament and reject the authority of the rabbins. Formerly the Karaites were widely diffused, but are now confined mainly to the Crimea, and to a few scattered groups in Lithuania, Galicia, Syria, Jerusalem,

Constantinople, and Alexandria, numbering altogether about 6,000.

Kara-Kalpaks, *i.e.* "Black Caps," a Turki people of Khiva and Bokhara, in speech and customs similar to the Kirghiz and in features intermediate between the Kirghiz Kazzaks and the Uzbeks; large head, flat full face, large eyes, flat nose, pointed chin, stout thick beard, the largest and strongest race in Central Asia. Formerly nomads, are now partly settled, and engaged chiefly in cattle-breeding. Chief tribes: Baymakle, Khandekli, Achamayli, Kaychili, Kitai, Ingakli, Kenedoz, Shaku, Tomboyun, Ontonturuk, about half a million altogether. The Kara-Kalpaks settled in the 12th century in the Kief district, South Russia; are now absorbed in the surrounding Little Russian populations.

Karakoram, or TSUNG LING MOUNTAINS, a division of the Himalayas extending from the Hindoo Koosh in the west along the boundary of Cashmere into Tibet on the east. The range in general varies in height from 18,000 feet to 25,000 feet, but the peak known as K2 is over 28,000 feet high. The Karakoram Pass, almost in the centre of the chain, and the head of the Shayok Valley, is about 18,500 feet high. It was found by Dr. Thomson, who ascended it in 1848, to be quite free from snow. The old capital of Mongolia, ruins of which remain, also has this name.

Karamnasa ("Destroyer of pious souls"), a river of Hindustan, which is a tributary of the Ganges, and forms the boundary between Behar and Allahabad. Its name is derived from the belief of the Hindoos that contact with its waters nullifies the effects of former pious acts.

Karamzin, NICHOLAS MICHAILOVITCH (1765–1826), a Russian historian, novelist, and poet, after serving for some time in the Imperial Guards, went on tour in Western Europe, visiting England among other countries. His *Letters from a Russian Traveller*, published in 1789, were translated into both French and English. The great work of his life was his *History of the Empire of Russia*, consisting of 12 vols., which appeared between 1816 and 1828.

Kara Sea (*Kara* = "Black"), that part of the Arctic Ocean which lies between Novaia Zemlia and the boundary between Russia and Siberia. The name is also given to a bay on the same coast, and to a river which enters it, after a course of 150 miles, beginning in the Ural Mountains. The Kara Sea has been explored by Nordenskjöld and Wiggins. It is navigable from July to September.

Karategghins, an Iranian people of Eastern Turkestan akin to the Tajiks and Galchas of Kohistan; speak a Persian dialect with some local peculiarities, but differing little from the dialect current in the Zerafshan Valley. The Karategghins, who number about 100,000 altogether, are, in the strict sense of the expression, the "hewers of wood and drawers of water" throughout Russian Turkestan.

Karategin, a mountainous district of Upper Bokhara, watered by a stream of that same name, a tributary of the Oxus, is at the western base of the Pamirs about 120 miles south of Khokand. Fruit and corn are grown by the Tajiks, whose Khans were independent until 1868.

Karauli, a native state in Rajputana, Hindustan, with a capital of the same name surrounded by a wall of sandstone. The district is rich in timber.

Karens (KARAEN, KARYAN), a widespread primitive people of Indo-China, scattered in countless small groups throughout Tenasserim, Arakan, Pegu, and on the Burma-Siamese frontiers. There are three main divisions—the White, Black, and Red Karens, so designated from the colour of their dress. Most of the tribal names—such as Sgau, B'ghai, Puo, Taru, Mopgha, Kai, etc.—have simply the meaning of “Men” in their several dialects, all of which are closely related, forming an important branch of the Tibeto-Burman linguistic family. But there is considerable physical diversity, though, as a rule, the Karens are a stout, muscular people, of short stature (5 feet 4 inches), yellowish complexion, but in the north often nearly as fair as that of Europeans, jet black straight hair, flat Mongolic features. The Karens, who number collectively over a million, are mostly nominal Buddhists, but at heart fetishists and spirit-worshippers. Some have given a favourable reception to the Protestant missionaries, and as many as 80,000 were returned as Christians in the census of 1880 for British Burma. The Karen-ni (Red Karens), who form a somewhat compact group of semi-independent tribes towards the Siamese frontier, are the best known, and are usually taken as the type of the whole race. (Rev. F. Mason, *Religion, Mythology, and Astronomy among the Karens*, *Journal of the Asiatic Society*, 1865, and many other writings.)

Karikal, a French possession on the Coromandel coast of Hindustan, some 20 miles north of Negapatam. It has an area of more than 50 square miles. The soil is fertile, and much rice is raised from it and is exported to Ceylon and the Straits Settlements.

Karli, the largest temple-cave of India, and the oldest known to exist, is on the road between Bombay and Poona. It consists of a porch, and an interior composed of a nave and two aisles terminating in an apse. Over the entrance is a large window, and the nave has fifteen finely-ornamented pillars. The temple is 126 feet long, 45 feet broad, and 45 in height.

Karnul, or KURNOOL, a district and town in the presidency of Madras with an area of 7,783 square miles. The town is situated on the right bank of the Kistna, which is the boundary between the presidency and the Nizam's dominions. Fever is frequent, and in 1877–78 there was a grievous famine.

Karoks, a North American people, who formerly occupied the Klamath river valley, about the borders of California and Oregon, jointly with

the Yuroks and Modoks. These names indicate the several positions of the three tribes, *Ka-rok* meaning the “lower river,” *Yu-rok* the “upper river,” and *Mo-dok*, the “head of the river.” The Karoks are described as physically the finest of all the Californian natives—tall, shapely figures, well-proportioned extremities, features more regular than those of most Indians. Their arms were the bow and arrow and a chipped stone, with which fearful wounds could be inflicted in hand-to-hand fights. They worshipped the spirits of the earth and forests, and paid great respect to the dead, who were buried with much ceremony. (R. S. Powers, *Tribes of California*, in *Contributions to American Ethnology*, Washington, 1877.)

Karons, a savage people of north-west New Guinea, who occupy the uplands back of Geelvinck Bay; visited in 1879 by M. Raffray, who regards them, not as Papuans, like most of the New Guinea populations, but true Negritos, resembling the Aeta aborigines of the Philippine Islands. They are an extremely rude people, living exclusively by the chase, dwelling in wretched hovels made of branches, wearing no clothes except a few strips of bark dangling from a string round the loins, and addicted to cannibalism, which, however, is restricted to the enemy killed in battle. Short, thick-set figures, curly hair, very prominent superciliary arches, deep brown complexion, wild unsteady glance. (*Tour du Monde*, xxxvii.)

Karotis, a chief branch of the Povindah Afghans, who occupy the Dwa Gomal Valley and the hills east of Paltu; three main divisions: Zaku Khel, Ya Khel, and Adin Khel; appear to be originally Ghilzaes, who joined the Povindahs in comparatively recent times.

Karr, JEAN BAPTISTE ALPHONSE, commonly known as Alphonse Karr, was born in 1808 at Paris. The future writer was educated at the Collège Bourbon, and became a journalist. As a journalist he became editor of the *Figaro*, and in 1839 began to conduct a satirical monthly called *Les Guêpes*. Of his novels *Sous les Tilleuls*, published in 1832, was the first and best. He was a great gardener, and his *Autour de mon Jardin* was translated by J. G. Wood. His memoirs, written at Nice, whither he had retired in 1848, appeared in 1879, under the title *Le Livre de Bord*. He died in 1890.

Karroo, a name given to the high plains of South Africa, but usually applied to the Great Karroo, a plain situated between the Nieuweveld Berge on the north, and the Zwarte Berge on the south. Rain does not fall for nine months in the year, but after the wet season large flocks are fed on the grass which springs up.

Kars, the capital of a district ceded to Russia by the Treaty of Berlin (1878), is situated on a tributary of the Arar about 110 miles N.E. of Erzerum. It stands in a very strong position 6,000 feet above the sea-level, and, as an important fortress, was for a long time a bone of contention between Russia and Turkey. In 1828 it was captured from the Turks by Paskevitch; in 1855 it stood a siege of six months under General Williams,

an account of which has been written by Laurence Oliphant; finally, it was taken by storm by General Lazareff in November, 1877, after having been for some months the centre of operations.

Karshi, a town in the Khanate of Bokhara, Central Asia, about 80 miles S.S.W. of Samarcand. Its ancient name was Naksheb. Commercially it was one of the most important cities of Central Asia, knives and firearms being sent from it to all the surrounding countries.

Karún River (Persian KURAN), a Persian river of some importance, rises near Ispahan and, flowing first west, takes a southerly direction just above Shuster, and empties itself into the Persian Gulf a few miles to the east of the mouth of the Tigris. It has a total course of about 300 miles, but is navigable only for about two-thirds of its length, and at Ahwaz rapids impede navigation even within the navigable distance. The importance of the river as a channel for trade was pointed out so early as 1842, but it was only in 1888 that, in consequence of the representations of Sir H. D. Wolff, the Karún was thrown open to the vessels of all countries by royal proclamation.

Karyokinesis, the series of changes in the nucleus of a living cell which take place when it divides.

Kas, an ancient people of the Upper Indus, who, according to Sultan Baber, gave their name to Kashmir. W. Erskine thinks the *Kasia regio* and the *Kasii Montes* of Ptolemy beyond Mount Ionaus were inhabited by the same people, whose dominion at some period extended from Kashgar to Kashmir, in both of which countries they have left their names.

Kaschau, KOSITZE, or KASSA, a town in the north of Hungary, about 100 miles N.E. of Pesth. This ancient city, which is situated very picturesquely in the valley of the Hernad, is no less famous for its hams than for its Gothic Cathedral. It had once also a Jesuit university. In its square the river divides and forms an island on which is a statue of St. John Nepomuk. Kaschau has a royal tobacco factory and an agricultural institute, and is the residence of a Roman Catholic Bishop.

Kashan, a town of Persia rather less than 100 miles N. of Ispahan. It stands more than 3,000 feet above the level of the sea in a district abounding in fruits. Kashan itself has an active trade in shawls, silk stuffs, and agricultural produce, and is particularly noted for its glazed tiles called *kashi*. It contains a royal palace, and many mosques and baths.

Kashgar, the capital of Chinese Turkestan, stands on a river of the same name, which waters a district noted for its many excellent fruits. It has been in the possession of China since 1758, though there was in 1864 a rebellion of the Turks, who form the greater part of the inhabitants, by which it was withdrawn from their power till 1879. The new city (Yenghi Sheher) is divided from the old by the river. It is the residence of the Chinese Governor and of the Russian Consul, who, being the sole representative of European Powers, has

obtained for his country not only the whole of the foreign trade, but an important political predominance. The manufacture of cotton and silk goods, porcelain, and other articles flourishes; and Kashgar is also a sacred city of the Mohammedans, who come hither to visit the shrine of Hazreti Appak Khodja.

Kashgari, a mixed Tatar people akin to the Uzbeqs, forming the bulk of the population in Kashgar, with settlements in Ferghana, Andijan, and neighbouring districts, East Turkestan. Tall stature, olivaster complexion, black, red, or chestnut hair, full beard, brown eyes. Speech a marked Turki dialect current throughout Eastern Turkestan, but spoken in its purest form in the province of Aksu; has long been cultivated, and was formerly written in the Tatar character of Syrian origin, which is now replaced by the Arabo-Persian. (Ch. de Ujfalvy, *Revue d'Anthropologie*, 1879, p. 489.)

Kashmiri, the dominant people of Kashmir, North-West India, who are of nearly pure Aryan stock; tall, strong, well-built, with regular European features, light olive and even fair or ruddy complexion. The language (Kashur) is a Prakrit, or Neo-Sanskritic tongue, spoken with considerable diversity in the different provinces, and overcharged with Persian elements. It is a harsh, rude language, which appears never to have been cultivated, although there was an old Kashmiri alphabet, the so-called Sharada Achhar, which was introduced into Tibet in the 7th century. This script appears to have been used exclusively for Sanskrit works, and is, in fact, incapable of rendering the peculiar Kashmiri phonetics. Modern Kashur is written with the Persian alphabet, at least by the Mohammedans, who form the bulk of the population; inhabitants of Kashur speech about 1,650,000 (1891).

Kaskaskia, a river of Illinois, U.S.A., rises in the centre of the state, and flows for more than 200 miles in a south-westerly direction till it joins the Mississippi about 50 miles S. of St. Louis. Two places in Illinois also bear this name, one of which, near the junction of the river with the Mississippi, was the capital of the former territory of Illinois.

Kassassin, a canal-station between Ismaïlia and Zagazig, Lower Egypt, which was the scene of an action between the British troops and those of Arabi Pasha in 1882.

Kassubs, small groups of Wends (Slavs) still surviving amid the Teutonic populations of North-East Germany, most numerous in the Stolp district, Pomerania, and in the Karthaus and Neustadt circles, East Prussia. They give their name to the tract known as *Kassubenland*, comprising the part of West Prussia west of the Vistula, where none now survive.

Kastamuni, or CASTAMBUL, a town of Asia Minor, about 75 miles S.W. of Sinope, the name being also given to the whole coast from the mouth of the Sakaria to Sinope. It is now a fairly flourishing manufacturing town, and was once celebrated for its copper-wares. Its name is supposed to be derived from the fact that the castle of the Comneni was here.

Katabolism, or destructive metabolism, is a term employed in physiology, especially in that of plants, for all the processes of decomposition by which the relatively complex organic substances in the living organism are spontaneously broken down into relatively simpler substances. These processes are largely produced by zymoses or unorganised ferments (q.v.), such as diastase (q.v.), invertin, emulsin, and peptogenes; but simple oxidation also occurs. Respiration (q.v.) is to a great extent a conditioning cause, and in part a result, of katabolism. The products of the process are those *waste-products*, such as carbon-dioxide and water, which are exhaled, the organic acids, aromatic substances, colouring-matters, glucosides, alkaloids and waxes, which may be excreted by glandular action or may only be secreted; and also some of the plastic materials. Growth and movement involve a dissipation of energy, requiring a supply of oxygen and resulting in the giving-off of heat and even in some cases of light. [PHOSPHORESCENCE.] The heat evolved is generally not sufficient to produce a sensible rise of temperature, but it does so in germinating seeds, as in malting, and in some cases of flowering, such as that of the aroids. [PHYSIOLOGY.]

Kataghan, an important branch of the Uzbek Tatars, who form the mass of the population in Kunduz and Balkh (Afghan Turkestan), from the northern slopes of the Hindu-Kush to the left bank of the Upper Oxus, with a few groups on the right bank in Bokhara; small stature, broad flat features, small oblique eyes, beardless face. Formerly nomads, now mostly sedentary traders and agriculturists; all Sunnites (orthodox Mohammedans); two main divisions, *Besh-bula* with five sub-groups, and *Cheguna* with sixteen sub-groups; total population 220,000 in Afghanistan, 45,000 in Bokhara. (C. M. Macgregor, *Afghanistan*, 1871.)

Kater, HENRY (1777-1835), an English man of science of German descent, was born at Bristol. He passed two years in a lawyer's office, and in 1794 entered the army. He served some years in India, where he was employed in triangulation and in the measurement of an arc of the meridian. He was placed on half-pay in 1814, and was next year elected F.R.S. He suggested an improved hygrometer; devised an improved pendulum; and in 1821-23 was one of Arago's assistants in making observations for determining the difference of longitude between the meridians of Greenwich and Paris. In 1817 he received the Copley Medal for the invention of a new pendulum; he also invented the floating collimator.

Kater's Pendulum was invented by Henry Kater, and used by him about 1817 to determine the length of the seconds pendulum. It consists of a long metallic bar provided with knife-edges at two points—one near each end. Between the knife edges are two movable weights, which can be so arranged that whichever way up the pendulum is suspended, the time of oscillation is the same. The distance between the two edges, which are thus made to become in turn centres of suspension, can

be proved to be equal to the length of the equivalent simple pendulum. From this the length of the seconds pendulum can be calculated, for the time of oscillation of a single pendulum is proportional to the square root of its length. [PENDULUM.]

Kathiawar, a bowl-shaped peninsula on the N.W. coast of India, having the Gulf of Cutch on the N. and that of Cambay in the south. Rajkot, the capital, is the seat of the Kathiawar Agency, a collection of 187 states formed in 1822. Of these, 105 are tributaries of the Imperial Government; of the rest some are independent, and some tributaries of native princes. Much cotton is manufactured for export.

Kathri, a large and influential trading caste, Punjab, North-West India; two main divisions: Sarin with eight branches, and Bhanjai with three branches. There are altogether no less than 150 minor groups, with total population 400,000. (Sherring, vol. ii., p. 76.)

Katkoff, MIKHAIL NIKIFOROVITCH (1818-87), a Pan Slavist leader, was a native of Moscow, but studied also at Königsberg and Berlin. After becoming Professor of Philosophy in the university of his native place, he in 1861 began to edit the *Moscow Gazette*, which, under his direction, soon abandoned Liberal politics for reactionism, combined with the extension of Russian influence over Poland and the other non-Russian dominions of the Tsar. The influential publicist died at Snamensky after having attained considerable popularity.

Katodis, aborigines of North Konkan, northern extremity of the Western Ghats, west coast of India: probably a branch of the Varalis, and like them are low-castes, regarded as impure by the Hindus, who nevertheless fear them for their reputed magic power. The Katodis are one of the most degraded people in India, feeding on rats, reptiles, and even carrion, and worshipping the *Acacia catechu*, the tree from which they extract the *kât* (*terra japonica*), which is their chief occupation.

Katrine, LOCH, a lake in Western Perth, touching the N. of Stirling on its W. border. It stands considerably more than 300 feet above the level of the sea, and has an area of 3,119 acres. Its average breadth is about three-fourths of a mile, and it is in some places more than 350 feet deep. Between it and Loch Vennachar on the E. are the Trossachs, and at its S.E. corner rises Ben Venue, 2,393 feet in height. The lake is associated with Scott and Wordsworth, the former making it the scene of his *Lady of the Lake*. From Loch Katrine the city of Glasgow draws its water supply.

Kauffmann, ANGELICA (1741-1807), a fashionable portrait painter, was born at Chur, canton Grisons, her father being an artist. She devoted herself to historical subjects during a residence at Rome, and having studied in the Venetian School at the fountain-head, came to London in 1766. Here she lived with her father in Golden Square, and painted portraits of Queen Charlotte, Christian III. of Denmark, Garrick, and the Princess of Brunswick with

her child. The last is in the Hampton Court collection. She exhibited at the Academy between 1761 and 1797, and painted the ceiling of Burlington House Council Chamber. In 1781, soon after her marriage with Zucchi, a Venetian painter, she left England. In 1787 she met Goethe at Rome, and painted his portrait. Among her numerous admirers were Joseph II., Sir Joshua Reynolds, by whom she was twice painted, Goldsmith, and Klopstock. She continued to paint till the last, and died at Rome in 1807. In 1767 she was secretly married to a Count de Horn, who turned out to be an impostor.

Kaufmann, CONSTANTINE VON (1818-82), Russian general and administrator, was born at Maidani, in Poland. He first distinguished himself in the Caucasus during the Crimean War, at the beginning of which he was a lieutenant and at the end a major-general. Having been successively director of engineers and Governor of Lithuania, he entered upon the field of his greatest exploits, when in 1867 he became Governor of Turkestan. In the following year he occupied Samarkand; in 1873 he made an expedition to Khiva, and forced the Khan to become a vassal of the Tsar; he next, unmindful of British protests, subdued the Tekke Turkomans and the Khan of Khokand; and finally succeeded in embroiling England with Afghanistan by inducing the latter to receive a Russian mission. Although he had extended Russian influence from the Sea of Aral to the borders of Afghanistan, his designs upon Merv were considered premature by the advisers of the Tsar, and he was on a visit to Moscow to put forward his views at headquarters when he died.

Kaulbach, WILHELM VON (1805-74), a German painter of the Düsseldorf and Munich School, was born at Arolsen, in Waldeck. He became the pupil of Cornelius at the Düsseldorf Academy, and in 1826 accompanied him to Munich, where in 1849 he became Director of the Academy of Painting. Here he executed for the King of Bavaria his *Battle of the Huns* and numerous mural decorations, and illustrated *Faust*, *Reinecke*, *Fuchs*, and other German classics. In 1847 he began to be engaged upon the decoration of the staircase of the Berlin New Museum, and in twenty years produced six enormous frescoes and numerous smaller designs.

Kaunitz, WENZELIUS ANTON, PRINCE VON (1711-94), a great Austrian diplomatist, was born at Vienna. Like Talleyrand, he was destined for the priesthood, and actually received orders; but, as his elder brother died, he was able very soon to enter upon the career of a diplomatist. He was named Aulic Councillor in 1735, and, having gained some distinction in missions to several of the Italian courts, was entrusted in 1744 with the then important post of minister to the Austrian Netherlands, where he for some time acted as Governor. In 1748 he signed the peace of Aix-la-Chapelle on behalf of Austria, and two years later was sent as minister to Versailles. Here, with the help of Madame de Pompadour, he accomplished a revolution in European politics by putting an end to the

hereditary rivalry of the Hapsburgs and Bourbons. Thus in the Seven Years' War Austria had the assistance of her old foe in the struggle with her young rival, Prussia, against which power Kaunitz and Maria Theresa directed all their efforts. From this time Kaunitz, now Chancellor, guided all the counsels of the Empress. Like her, he was opposed to the partition of Poland. Although he approved of the reforms of Joseph II., he had not equal influence with that monarch; but during the short reign of Leopold II. (1790-92) he resumed his pre-eminence. On the accession of Francis II. he was compelled by old age to retire.

Kauri Pine, *Dammara australis*, a coniferous tree from 150 feet to 200 feet in height, native to New Zealand. It yields a hard, brittle resin resembling copal, and known as *Kauri* or *Cordie* gum. This resin is also found in a fossil state. The annual export of the resin is valued at about £300,000, nearly half the amount exported going to the United States, and the other half—from 3,000 to 3,500 tons—to England. It is used in the manufacture of varnishes. The wood of the tree is much valued in New Zealand and Australia for lightness, elasticity, strength, and durability, it being well suited both for masts and for planking.

Kava, a beverage derived from the shrub of the same name; it is intoxicating, and was much used by the Polynesian natives.

Kavanagh, JULIA (1824-77), novelist and biographical writer, was born at Thurles. After passing most of her youth in Paris she came to London in 1844, and three years later published a tale for children. She was also the author of *Woman in France during the 18th Century*, *English Women of Letters*, and of *Daisy Burns*, *Rachel Gray*, and many other novels. She died at Nice.

Kaveri, THE, or CAUVERY, a river in Hindustan, has its source in the Western Ghauts, a little to the S. of Mereara, Mysore. It flows for a few miles in a northerly direction, and then takes an easterly course, until about 90 miles beyond Seringapatam, where it takes a southerly turn, finally joining the Coleroon some fifty miles E. of the Neilgherry Hills. The united stream having a length of nearly 500 miles, forms a large delta, the several mouths flowing into the Bay of Bengal. The Kaveri is of little use for navigation, as its stream is interrupted by frequent rapids, but it is an important fertilising agent, having been used for irrigation purpose from time immemorial.

Kaviaks, a people of Alaska, who dwell on the shores of Norton Bay and in the peninsula west of the Yukon river, to which they give their name. They are much taller and stronger than their Eskimo neighbours, whom they resemble in many respects. The Kaviaks, who were reduced to about 1,500 in 1870, shave the head, and have the curious custom of wearing two long bones like tusks attached to both sides of the mouth.

Kaye, SIR JOHN WILLIAM (1814-76), the military historian, second son of Charles Kaye, of Acton, was educated at Eton and Addiscombe, and

served for nine years in the Bengal army. He returned to England in 1845, and in 1856 succeeded John Stuart Mill as secretary of the political and secret department of the India Office, from which position he retired in 1874. He was a frequent contributor to periodicals, and the author of numerous works, the chief of which were *The History of the Sepoy War in India, 1857-58* (3 vols.)—which was continued by Colonel Malleson, and appeared in complete form in 1890 in 6 vols. entitled Kaye and Malleson's *History of the Indian Mutiny—Life and Correspondence of Lord Metcalf, Life and Correspondence of Sir John Malcolm, and History of the War in Afghanistan*.

Kazan, a government of Russia, having Nijni-Novgorod on the W., Viatka on the N., and Simbirsk on the S. It has an area of more than 24,000 square miles, and an increasing population. Forest covers about a third of the soil, but from the rest rye and wheat are raised. 2. Kazan, the capital, stands on the left bank of the Volga, 430 miles directly E. of Moscow. Some 30 miles N.W. of its site stood the old capital of a Mongol kingdom which was conquered by the Russians in 1552. Of this date are its cathedral and monastery. Kazan is important both commercially and as an educational centre, and the growth of its population of recent years has been rapid. The export trade to Asia Minor and Central Asia is carried on by the Tatars. Leather, soap, gunpowder, and candles are made here. The university, Kazan's chief glory, was founded by Alexander I., and has a fine library and observatory and upwards of 1,000 students. The city is the see of a Greek archbishop, and contains an image of the Virgin which works miracles, and a sacred tower called the Sumbek.

Kazi-Kumukh, Caucasian aborigines, who call themselves *Lak*, and who appear to be a branch of the Lesghians. They were the first people of the Caucasus to adopt the Mohammedan religion, and from this circumstance received the title of *Ghasi* (whence *Kazi*). Champions of the Faith; *Kumukh*, the second part of their name, indicates the chief place in their territory, which lies in Central Daghستان. The Lak language, extremely harsh and guttural, is spoken by about 30,000 persons in a district 800 square miles in extent.

Kazvin (CASVEEN), a Persian town situated midway between Teheran and Resht. Since the opening of the Transcaucasian Railway it has gained in importance. The manufacture of brocade and velvet is carried on here, and horses and camels are bred.

Kea. [KAKA.]

Kean, EDMUND (1787-1833), one of the greatest of English tragedians, was the son of a certain Anne Corey, who was said to be descended from Savile, Lord Halifax (q.v.). In 1801 he played in *King John* at Drury Lane with J. P. Kemble and Mrs. Siddons; but soon after he ran away, and, while acting as a tumbler in Saunders' circus, broke both his legs. In 1806 he made an appearance at the Haymarket, but, being refused an engagement

by Kemble, betook himself to the provinces, acting again with Mrs. Siddons. It was not till 1814 that he obtained his first important engagement in London. His appearance at Drury Lane in that year as Shylock was perhaps the most successful *début* of a great actor. During this season he also played Richard III. (probably his greatest part), Hamlet, Othello, and Iago. His acting was highly appreciated by judges such as Hazlitt and Coleridge. He also played in the provinces these and parts in modern plays, and on Kemble's retirement in 1817 was recognised as king of the stage. In April, 1820, he impersonated Lear with success, and in the same year he paid his first visit to America, where at New York, Philadelphia, and Boston he repeated his successes. The irregularity of his private life temporarily interrupted them. In 1825 he was howled down in London and in several Scotch towns, and in America also, his life even being in danger at Boston. In 1827, however, he reappeared at Drury Lane, and in the same year began an engagement at Covent Garden, which lasted for two years. He then returned to Drury Lane, but now began to lose his memory. He died in 1833.

Kean, CHARLES JOHN (1811-68), the second son of Edmund, was born probably at Waterford, and educated at Eton. He quarrelled with his father with regard to his treatment of Mrs. Kean, but afterwards played with him. In 1827 he made his *début* at Drury Lane in *Douglas*, and was fairly successful, and first acted with his father at Glasgow in October of the following year, Edmund playing Brutus and his son Titus in Howard Payne's *Brutus*. In 1829 Charles Kean acted in Holland, and in the following years played with some success in America his father's great part of Richard. In 1838 Charles Kean declined an engagement offered him by Macready, and the following year again visited America. In 1842 he married Ellen Tree, with whom he was playing in *Romeo and Juliet* at the Haymarket. After an engagement at Drury Lane and a third American visit the Keans reappeared at the Haymarket for several seasons. In 1850 Kean became part manager of the Princess's, and in the following year as sole manager began his spectacular revivals, among which were *King John*, *Macbeth*, Byron's *Sardanapalus*, and *King Henry VIII*. In 1859 he gave up the management of the Princess's, and in the same year a public banquet was given in his honour. In 1861 he began a season at Drury Lane, and after his farewell next year went round the world. In 1866 he again appeared in London, and took leave of the stage at Liverpool in 1867, in his best part, Louis XI. (Boucicault).

Keary, ANNIE (1825-79), novelist, was born at Bilton Rectory, Yorkshire. After publishing several children's books, she began novel-writing, *Castle Daly* (1875) being perhaps her best effort. She was also the author of *Early Egyptian History* (she had spent the winter of 1858 in Egypt), and *The Nations Around*. Her last novel, *A Doubting Heart*, was finished by Mrs. K. Macquoid. A memoir of her was written by her sister Eliza, who collaborated with her in *Heroes of Asgard*.

Keats, JOHN, was born on the 31st October, 1795. His father, ostler in the livery stables of Mr. Jennings, at Moorfields, married his employer's daughter, and carried on the business after him. He died when his son was nine years old, and his widow soon married again, but unhappily. Separating from her husband, she retired to Edmonton, which therefore became the home of the poet, who was already at school at Enfield, where he formed a lifelong friendship with his master's son, Charles Cowden Clarke. Upon the death of his mother in 1810 he became ward of Richard Abbey, a tea-dealer, who apprenticed him to a surgeon at Edmonton named Hammond, and his next years were passed between the study of medicine and that of literature. He knew no Greek, but at school he had fallen under the fascination of the Greek spirit, as revealed in the stories of mythology. He now felt the influence of Spenser, and began to turn for inspiration to him and to the other writers of the Elizabethan age, rather than to the authors of the eighteenth century. Before long he quarrelled with Mr. Hammond, and in 1814 went to London to attend the combined courses of St. Thomas's and Guy's Hospitals. He passed his examination in due course at Apothecaries' Hall, but already recognised that his calling was to letters. Clarke introduced him to Leigh Hunt, at whose house he met many literary men. Haydon, J. H. Reynolds, Joseph Severn, and Charles Dilke became his close friends. Among his acquaintances were Shelley, Godwin, Wordsworth, Lamb, and Hazlitt. Several of his sonnets were published by Hunt in *The Examiner*, and republished, with other poems, in book form in 1817. He then went, for a time of solitary study, to the Isle of Wight, where he began *Endymion*. This poem he brought out in the following year, which was also marked by the composition of *Isabella* and by a walking tour in Scotland, the fatigues of which caused an affection of the throat that was never entirely cured. He returned to encounter harsh reviews in *Blackwood* and *The Quarterly Review*, but this did not prevent his beginning another poem, *Hyperion*, which, having written two versions of the earlier part, he laid aside as too Miltonic in tone. He now lived chiefly at Hampstead, where he became engaged to Miss Fanny Brawne. The engagement was not a happy one. His passion preyed upon a mind already fevered by ill-health and the "continual burning of thought." Yet the following year was a noble creative period. In it he wrote *The Eve of St. Agnes*, the *Ode on a Grecian Urn*, and *La Belle Dame sans Merci*. At the same time he composed the dialogue for a tragedy, *Otho the Great*—of which his friend Brown supplied the plot—his poem *Lamia*, and part of a comic "faery" poem, *The Cap and Bells*. At this point his work was broken by consumption. Ordered to Italy, he went to Rome with Severn, who nursed him tenderly until the end came on the 21st February, 1821. His epitaph is in the *Adonais* of Shelley, written under the false impression that the *Quarterly* article had killed him, but embodying a magnificent tribute to his genius and his love for nature. Much in his poems was immature, but as a whole they are without a rival in the glow of

feeling which cast the richer and more complex moods of modern life into classical forms, and in the wealth of imagery which fulfilled his aim "to load every rift with ore."

Keats, SIR RICHARD GOODWIN, naval commander, born in 1757, was educated at New College School and Winchester College, but seized an opportunity in 1770 of entering the navy. He served during the American Rebellion, at the capture of a French convoy from Martinique, in Keppel's action off Brest in 1778, in Rodney's relief of Gibraltar, and in Rodney's victory over De Langara. He was made commander in 1782. In 1803 he formed part of Nelson's command off Toulon, and was in 1804 detached on three occasions to exact satisfaction from the Dey of Algiers. He was afterwards employed in the Baltic, and, as rear-admiral, in 1807 brought home the Danish prizes from Copenhagen, but returned to the Baltic, and there continued to render valuable service. In 1810 he took command of the squadron off Cadiz, and in 1813 at Newfoundland. He died in 1825.

Keble, JOHN (1792–1866), Anglican divine and sacred poet, was born at Fairford, Gloucestershire, his father being vicar of a neighbouring village. By him John and his brother were educated, the former being elected scholar of Corpus Christi, Oxford, in 1806. Five years later he took a double first, and was elected fellow of Oriel. In 1812 he won the prizes for English and Latin essays, and in 1815 was ordained. He left Oxford in 1823, having been a college tutor for five years, and went to live at Southrop, where he held the cure of three small parishes. In 1825 Keble went to a curacy near Winchester, but left it to help his father. In 1831 he was appointed Professor of Poetry at Oxford, and held the chair for ten years. In 1836 he accepted the vicarage of Hursley, which had been previously offered him, and there passed the remainder of his life in the fulfilment of his parish duties and in study. Three years after his death, in 1869, Keble College, Oxford, was opened to commemorate his life and encourage his doctrines. Newman declares that Keble was "the true and primary author" of the Oxford Movement. The collection of hymns embodied in the *Christian Year* was published in 1827, and their popularity has seldom been exceeded. Upwards of a hundred editions of the work have been published. In 1836 he published an edition of Hooker, which, revised by Deans Church and Paget, remains the standard edition; and he also contributed to the *Library of the Fathers*. Seven of the *Tracts for the Times* were from Keble's pen, the most notable being that *On the Mysticism Attributed to the Early Fathers*. His poetry lectures were published in Latin; and in 1846 *Lyra Innocentium*, a book of religious poems, valued by some critics more highly than the *Christian Year*, were written to add to the profits of the latter, which were devoted to the restoration of Hursley Church. In 1863 was published his last important work, *The Life of Thomas Wilson, Bishop of Sodor and Man*, whose name is familiar to readers of Matthew Arnold.

Kedge, or KEDGE ANCHOR, a small anchor often used to keep a ship steady and clear of her bower anchor while riding in harbour. It is also used for warping a ship. For this purpose it is carried out in a boat and dropped, and the ship is then hove up to it, when, if necessary, it is weighed and the operation is repeated. In the old days the largest kedge for a 100-gun ship weighed $10\frac{1}{2}$ cwt., and a small brig's kedge 2 cwt.

Keeling, or COCOS ISLANDS, a coral group in the Indian Ocean (lat. $12^{\circ} 5' S.$, long. $96^{\circ} 53' E.$), were discovered in 1699 by the navigator who gave his name to the largest islet. They form a ring round a lagoon only approachable by ships on the north side, and as they abound in cocoa-palms and good water form a convenient station. The English took possession of them in 1857, and the inner basin is called Port Albion.

Keene, CHARLES SAMUEL, was born at Hornsey in 1823, being the son of a solicitor in whose footsteps he was trained to follow. A marked gift for drawing led his mother to transfer him to an architect's office, whence he passed to the workshop of the Whympers, famous wood-engravers. His apprenticeship over, he at once found work on *The Illustrated News*, *Once a Week*, and other papers. For ten years he had been an occasional contributor to *Punch*, but did not join the staff until 1860, when he to some extent filled the gap left by John Leech. He died in 1891.

Keeper of the Great Seal, another name for the Lord High Chancellor of England, who is invested with office by the delivery of the Great Seal into his care. This Keepership is occasionally put into commission.

Keewatin, a name given to the district lying N. of Manitoba, E. of Lake Winnipeg, and W. of the coast of Hudson's Bay, and extending N. as far as the 55th parallel of latitude. It has been cut into for the purpose of enlarging Manitoba and Ontario, but has still an area of 280,000 square miles. The inhabitants consist of a few scattered Eskimos and trappers, under the rule of the Lieutenant-Governor of Manitoba. Cultivation for the most part is impossible, but there are natural growths of timber and mineral resources as yet undeveloped. Fishing in the lake and rivers, especially the mouth of the Saskatchewan, is successfully carried on. Norway House, a great centre of fur trade, lies in the N. of this region.

Kei, THE GREAT, a river of South Africa which, rising in the Storm Bergen, reaches the ocean at Cape Morgan, and during the latter portion of its course forms a boundary between Cape Colony and Kaffraria. This demarcation is now, however, more nominal than real, seeing that the Transkei, which includes Fingoland, Gealekeland, and other tribal areas, is governed by a magistrate appointed from Cape Town.

Keighley, or KEITHLEY, a market-town in the West Riding of Yorkshire, standing on the River Aire, 9 miles N.W. of Bradford, whence it is reached by the North Midland Railway. It is a growing and

prosperous place, owing to the development of the worsted and cotton manufactures and the production of washing machines. There are good public buildings, a grammar school, and a mechanics' institute.

Keim, THEODORE, born at Stuttgart in 1825, and educated at Tübingen, entered upon a pastoral career first at his native place and then at Esslingen. In 1860 he became Professor of Theology at Zürich, being transferred later on to Giessen, where he died in 1878. His earliest works deal with the history of German Christianity, or take the form of sermons, but stirred by the Rationalistic criticism of the day, he devoted his later efforts to the building up of a historical character of Christ. After two preliminary essays he brought out his great treatise, *The History of Jesus of Nazareth*.

Keir's Alloy, an alloy of copper, zinc, and iron, formed by melting the ingredients under powdered coke. It is hard, tenacious, and ductile, so that it can be readily worked, while it suffers little alteration by exposure to atmospheric influences.

Keith, JAMES, FIELD-MARSHAL, was born at Kincardine in 1696, being of a noble Scotch family. He joined the Pretender, was wounded at Sheriffmuir in 1715, but escaped to Spain with his brother, the last Earl Marischal, and there served for ten years in the Irish brigade. He transferred his services to Russia, fought gallantly against the Turks at Ochakof, and also against the Swedes, rising to the position of field-marshal, a rank which he retained, when, disgusted with Russian jealousies, he put himself at the disposal of Frederick the Great. He was highly appreciated by that warrior, and took part in the battles of Losowitz and Rossbach and the sieges of Prague and Olmütz, being killed in 1758 at Hochkirchen.

Keith, HON. GEORGE KEITH ELPHINSTONE, first Viscount, was born in 1747, and posted in 1775. He was promoted to flag-rank in 1794, and took part in the Glorious First of June victory, when he lost a leg. In the following year, with a squadron, he reduced the Cape of Good Hope. In 1796 the Dutch attempted to retake it, but their expedition, after some parley, surrendered to Sir George. In consequence of this he was in 1797 created Baron Keith in the peerage of Ireland, and was soon afterwards given a post in the Channel Fleet. In 1799 he was promoted to be vice-admiral and commander-in-chief in the Mediterranean. He died in 1823.

Kel-Ahamellen, a large division of the northern Tuaregs, who formerly occupied the whole of the Ahaggar plateau, North Central Sahara. Here still survive fourteen independent tribes, all claiming direct descent from the Kel-Ahamellen; but the claim appears to be justified only in the case of the Kel-Ahamellen-wa-n-Taghert, who dwell on the Muydir plateau between Ahaggar and the Twat oasis.

Kelat, or KHELAT, the capital of Baluchistan, stands in a gorge nearly 7,000 feet above sea-level, on the flank of the Shah Mirdan. The position is

strong, but the citadel and mud wall are of little military value. There are fair bazaars, where a large trade is carried on with surrounding tribes, but arms are the only local articles of manufacture. The climate is healthy and dry, and many European fruits and vegetables thrive here. It was taken by the British in the Afghan War of 1839, but given back. In 1854 the Khan was subsidised, and in 1873 his failure to fulfil his promises led to his being placed under military surveillance, and a resident is now maintained at Quettah, who keeps an eye on the movements of the capital. [BELOOCHISTAN.]

Kel-Gueres, a chief branch of the Aïr (Asben) Tuaregs, Central Sahara, who, with the kindred Itisân, form a confederacy distinct from and hostile to the Kel-Owi. They reached this region from the north early in the 18th century; but about the year 1835 were driven by the Kel-Owi farther south and west in the direction of the Aweliminiden Confederacy. The Kel-Gueres are full-blood Tuaregs, and very warlike, fighting on horses and camels, armed with lance, sword, dagger, and an enormous shield of ox or antelope hide. The confederacy numbers about 25,000 souls, and can muster about 5,000 mounted warriors.

Keller, GOTTFRIED, was born near Zürich in 1819, and studied painting for some years in Vienna. He felt a vocation later on for literature and politics, became State Secretary for his canton in 1861, and brought out several volumes of short tales, poems, and romances. Chief among his works are *Der Grüne Heinrich*, *Sieben Legenden*, *Züricher Novellen*, and *Martin Salander*. He died in 1890.

Kel-Owi, the dominant Tuaregs of the Aïr or Asben oasis, Central Sahara, which they reached from an unknown region in the north-west about 1750. Here they partly supplanted, partly amalgamated with, the Negro (Hausa) aborigines from Sudan; so that the Kel-Owi, although claiming to rank with the noblest of the Imoshagh peoples, are no longer of pure Tuareg stock; hence their dark complexion and other traces of black blood. But the Kel-Owi Confederacy, of which the chief divisions are the Irholan, Kel-Azaneres, Ikezkezan, Kel-Tafidet, and Kel-Fares, is very powerful, controlling the political and commercial relations throughout south Central Sahara, and capable of mustering at least 10,000 armed warriors mounted for the most part on swift dromedaries. The total population certainly exceeds 50,000, a very large number in this thinly-peopled region.

Kelp, the ash of various seaweeds prepared on the coasts of Scotland, Ireland, and Brittany, formerly as a source of carbonate of soda and now mainly for iodine. The chief algæ employed are the "cut weeds," *Fucus vesiculosus* (bladder-wrack), *F. nodosus* (knobbed-wrack), and *F. serratus* (black-wrack), which are cut from the rocks between high- and low-water marks, and the "drift-weeds," *Laminaria digitata* (tangle), and *L. saccharina* (sugar-wrack). They are dried in the sun, and then, according to the more economical modern processes, destructively distilled. About 20 tons of sea-weed yield a ton of kelp. Drift-weed kelp will

yield from 8 lbs. to 13 lbs. of iodine per ton; but cut-weed kelp much less. Nearly half the ash is insoluble, the soluble portion including 20 to 25 per cent. of potassium chloride, 10 to 12 per cent. of potassium sulphate, and 5 per cent. of sodium carbonate, besides other salts of sodium and magnesium. At the beginning of the century kelp was the main source of sodium carbonate, and some 20,000 tons were made annually in Scotland, its value being £20 per ton. On the introduction of Leblanc's process for preparing sodium carbonate from common salt the value of kelp fell to £2 a ton; but it rose in value as a source of iodine. The total production of kelp in the British Isles is now from 7,000 to 10,000 tons annually, and its value about £4 per ton.

Kelpie, a malignant water spirit, said to appear in the shape of a horse, especially during storms, as a presage of death by drowning.

Kel-Rhela (KEL-ERHLA), a noble Tuareg tribe, the most numerous and powerful of all the peoples of the Ahaggar plateau. They play a dominant part in the Ahaggar Confederacy, whose *amghâr* (supreme chief) is always a member of the Kel-Rhela group. Under them are numerous servile tribes, who do all the work, while the nobles attend exclusively to trade, war, and plunder. Without their consent no traveller can safely enter the Ahaggar district, and they also levy blackmail on caravans passing through their territory.

Kelso, a market-town in the county of Roxburgh, Scotland, standing on the north bank of the Tweed opposite the confluence of the Teviot, 22 miles from Berwick. The abbey was founded by David I. in 1124, but it was destroyed by Lord Hertford in 1545 with the exception of the fine Romanesque Church with its tower 90 feet high. This was used for Protestant worship until 1771, but it is now preserved merely as an ancient monument. The streets of the town, radiating from a central square, are well laid out. markets for grain, etc., are held weekly, and there are some factories of boots, woollen and linen goods, and iron. The North-Eastern and North British Railways have a station here. Floors Castle, the seat of the Duke of Roxburgh, is at the north-west extremity of the town.

Kelt. [SALMON.]

Kel-Tinalkum, a free but not a noble Tuareg tribe of the Azjar country, North Central Sahara. They take their name from the old fortified town of Tinalkum, the ruins of which are still seen south of El-Barkat on the caravan track between Ghat and Janet. After the capture of this stronghold they dispersed in all directions, and many are now found in the oases of the Wady Otba, Fezzan. At present they are chiefly occupied with trade, and many of the caravans between Tripoli and Central Sudan are equipped and escorted by this tribe. Although very numerous and armed with muskets, the Kel-Tinalkum recognise the political supremacy of the noble Orâghen Tuaregs.

Kemble, CHARLES, brother of JOHN PHILIP (q.v.), was born in 1775, and got employment in the Post Office, which he abandoned in 1792 for the family vocation. In 1803 he joined his brother at Covent Garden, and succeeded him in the management, thereby incurring great pecuniary burdens. As an actor he excelled in high comedy and in the middle range of Shakesperian types, such as Malcolm, Macduff, Aufidius. In 1840 he gave up the active exercise of his profession, and was appointed examiner of plays. By his marriage with Mlle. De Camp he became the father of JOHN MITCHELL (q.v.); of FRANCES ANNA (Mrs. Butler), a gifted actress and poet, who survived until 1892; and of ADELAIDE (Mrs. Sartoris), who displayed great musical abilities and died in Italy a year before her sister.

Kemble, JOHN MITCHELL, son of Charles and nephew of John Kemble, the famous actors, was born in 1807. Educated by Dr. Richardson, he acquired a taste for philology, and, winning an exhibition at Bury St. Edmunds School, went up to Trinity, Cambridge, where his conduct was erratic but not vicious. He was rusticated, and, joining the Spanish patriots, enjoyed some strange experiences, but ultimately returned to take his degree in 1830. In Germany, where he married a professor's daughter, his early prepossessions returned, and he took up the study of Anglo-Saxon with fervour, publishing in 1833 the *Poems of Beowulf*, with a glossary and commentary. This was followed in 1839-41 by his *Codex Diplomaticus Aevi Saxonici*, and in 1844 by *The Poetry of the Codex Vercellensis*. His most valuable work, *The Saxons in England*, was issued in separate volumes between 1849 and 1856. He spent six years in North Germany investigating the archæology of the Teutonic race, adding many interesting objects to the collection of antiquities at Hanover.

Kemble, JOHN PHILIP, was born in 1757, and his father, a provincial actor, destined him for the Roman Catholic priesthood. The hereditary instinct however, prevailed, and in 1776 he made his *début* on the stage at Wolverhampton. In spite of physical defects, he steadily gained ground with the public until, in 1783, through the previous success of his gifted sister, Sarah [SIDDONS], he secured the opportunity of appearing in *Hamlet* at Drury Lane. His position as Garrick's successor was speedily established, and, though he lacked perhaps fire and dash in action, yet in the personation of characters in which concentration and dignity are the essentials, he was unrivalled. As Coriolanus, Julius Caesar, and Macbeth he touched the highest level of dramatic art. In 1790 he plunged into the more hazardous venture of managership, and during the two or three years that he held possession of Drury Lane effected some useful reforms, but resigned owing to disagreement with Sheridan and other proprietors. In the following year he took a similar interest in Covent Garden, but the fire of 1808, the O.P. riots, and the want of business capacity, involved him and his brother Charles, with whom he was associated, in heavy losses and much trouble. Kemble retired from business in 1817, and lived for six years in

privacy, dying at Lausanne in 1823. He introduced into the theatre sound principles of archæology, and materially raised the social status of the actor. His own dramatic productions possessed little merit.

Kempfenfelt, RICHARD, British naval commander, son of a military officer, a naturalised Swede, was born at Westminster in 1718, and, though he entered the navy in 1730, did not become a lieutenant till 1741 and a captain till 1757. He commanded the *Elizabeth*, 64, in Pocock's actions with D'Aché in 1758-59, and at Masida, and was captain of the fleet under Hardy in 1778, and under Geary and Darby. Made rear-admiral in 1781, he commanded a squadron which scattered a French convoy escorted by a powerful fleet, and captured several of the merchantmen. In the following year he shifted his flag to the *Royal George*, 100, and off Brest, with Admiral Barrenston, fought another action, which resulted in the capture of two line of battleships and eleven transports. His flagship, proving leaky, was ordered to be careened at Spithead, and, this operation being improperly performed, she, on August 29th. 1782, overset at Spithead, and went down with the admiral and above 1,200 persons, of whom 300 were women. Only about 300 were saved. A monument in memory of this awful catastrophe was set up in 1783 in the churchyard at Portsea. Kempfenfelt was not only a brave, but also a scientific officer, and his death was a great loss to the service.

Kempis, THOMAS À, is the name by which THOMAS HAMMERKEN (MALLEOLUS), the son of a poor peasant, born at Kempen, near Düsseldorf, about 1380, became famous throughout the Christian world. His career was placid enough. Sent by his mother to school at Deventer, he came under the influence of Groot and Radewyn, but his bent was to study and retirement, rather than to mission work, and so he entered the convent of Mount St. Agnes at Zwolle, where he ended his days as sub-prior in 1471. His days were spent in the laborious task of the copyist, in the composition of a history of the monastery, and lives of Groot and Radewyn, and in the writing of a number of little simple tractates on monastic habits. None of these works gave indications of the power to be displayed in the marvellous embodiment of Christian precept and practice known as the *Imitatio Christi*. It has been conjectured that Thomas merely transcribed these pages from some ancient manuscript, or on behalf of some contemporary author, and the Benedictines have tried hard to vindicate the claims of John Gerson. Nothing, however, has been as yet adduced to deprive À Kempis of his credit, and the form of pietism developed in the book accords with the gentle mysticism, the freedom from ecclesiastical ambition, and the self-effacement of the poor monk of St. Agnes.

Kempten (CAMPODUNUM), a city of Bavaria, Germany, situated on the Iller, 64 miles distant from Augsburg by rail. The old town, called Stifts-stadt, from the abbey round which it clusters, stands on a hill, and is nearly surrounded by the

newer quarter that has been built on the plain below. It has the usual institutions of a district capital, as well as a public library and a Latin school. Woollen, cotton, and linen goods are the chief industrial products.

Ken, THOMAS, Bishop of Bath and Wells, was born at Little Berkhamstead, Herts, in 1637, and was educated at Winchester and Oxford. Izaak Walton, who married his step-sister, had considerable influence over his boyhood. He held various preferments, and in 1672 settled down at Winchester as Prebendary, fellow and chaplain to the bishop. In a *Manual of Prayers for the Use of the Scholars* appeared the two famous morning and evening hymns, "Awake, my soul," and "Glory to Thee, my God, this night." In 1688 he was one of the seven bishops who refused to publish James II.'s Declaration of Indulgence, and he went to the Tower. He refused, however, to take an oath of allegiance to William, and so was excluded from his see, passing his declining years in meditation and peace at Long-leat, Lord Weymouth's seat, where he died in 1711.

Kendal, or KIRKBY KENDAL, a market-town and municipal borough in Westmoreland, on the right bank of the Kent 20 miles N. of Lancaster, with which it is connected by the London and North-Western Railway. It was the earliest centre of woollen manufactures, Flemish weavers having settled there in the reign of Edward III., and it still produces heavy fabrics. Among the public buildings are an ancient church, a well-endowed grammar school, a town hall, and court house. Until 1885 the borough sent a member to Parliament, but it now forms part of a county division.

Keneghez, a branch of the Uzbek Tatars, Shehr-i-Sebz district, Bokhara, Sunnite Mohammedans, as renowned for their courage as the women are for their beauty. Originally a subdivision of the royal Manghit tribe, of which the reigning Bokhara family is a member, the Keneghez detached themselves from that connection about the beginning of the present century; but the independent state which they then established was reduced by the Russians and restored to the Khanate of Bokhara in 1868. Five divisions: *Kairasaly*, *Achamaïly*, *Tarakli*, *Chekhat*, and *Abakly*, partly settled, partly still nomads. Total population, 35,000 (?).

Kenia, MOUNT, is situated in Central Africa, a few miles S. of the Equator, about midway between Lake Victoria Nyanza and the sea, and nearly in the centre of the territories of the British South Africa Company. The summit is crowned with perpetual snow, and the crater wall rises to a height of 16,000 feet, the higher peaks stretching up 3,000 feet beyond. Count Teleki ascended to a considerable height in 1887.

Kenilworth, a market-town in Warwickshire, $4\frac{1}{2}$ miles N. of Warwick, on a branch of the London and North-Western Railway. It is an ancient place, deriving its name from Kenulph, King of Mercia, and containing ruins of a 12th-century abbey, a fine church, and a grammar school. The castle, however, is the most interesting feature, not

only because of its picturesque beauty, but owing to the romance with which Scott has associated its name. The older portions date from Henry I., and Elizabeth was entertained there by the Earl of Leicester in 1575. Kenilworth enjoys some trade in agricultural produce, and has some factories for ribbons, watches, combs, and chemicals.

Kennan, GEORGE, was born in 1845. He got his first knowledge of Russian and Asian life as a pioneer telegraphist. His chief work, the account of his travels and adventures in 1885-6, is the best recent *exposé*, in English, of "Siberia and the Exile System."

Kennedy, JAMES, a grandson, on his mother's side, of Robert III. of Scotland, was born about 1405, and trained on the Continent for the priesthood. In 1437 he was made Bishop of Dunkeld, where he showed much vigour and ability, and on being transferred in 1440 to the see of St. Andrew's he pursued his efforts for reforming the Church, and won the confidence of James II., who appointed him Chancellor. His advice materially aided the king in resisting the encroachments of the Douglas clan. In 1460 he became one of the Council of Regency, and did much to advance Scottish interests. The College of St. Salvator was founded by him, and he also built a ship for trading purposes at the then enormous cost of £10,000. He died in 1466.

Kennicott, BENJAMIN, CANON, D.D., was born in a humble station in 1718. His youthful abilities found patrons, who sent him to Exeter College, Oxford, where he soon made himself a name for biblical scholarship. He wrote in 1753 a treatise pointing out the imperfections of the Hebrew texts of the Scriptures, and money was raised to enable him to revise the Old Testament. This task occupied his whole life, for he brought out his book in 1776 and died in 1783, having collected between six and seven hundred manuscripts.

Kensington, an extensive suburban parish of West London, including Notting Hill and Kensal Green to the N., Brompton, Chelsea, and Earl's Court, to the S. It is often subdivided into Kensington proper, South Kensington, West Kensington, and North Kensington. The manor and village out of which it grew lay wholly W. of the palace of Kensington and the gardens surrounding it, now a public park, these latter being in the parish of St. Margaret's, Westminster. The existing High Street still retains some of its primitive character. William III. bought from Lord Chancellor Finch the residence in which he died and Queen Victoria was born, and for fifty years it was a favourite abode of royalty, whence Kensington became known as the Old Court Suburb. The Duchess of Portsmouth formerly occupied a house close to the same site. Holland House at the further extremity of the former village still preserves the memory of the Riches and Foxes, as Campden and Argyle Houses, the tenure of the manor by the Campbell and the Hicks families. The quarter is now crowded with palatial villas, and is much affected by literary and artistic celebrities.

Kent, a county occupying the south-eastern corner of England, being bounded N. by the Thames and the North Sea, E. and S.E. by the Straits of Dover, S. by the English Channel, S.W. by Sussex, and W. by Surrey. Its extreme length from Surrey to the North Foreland is 65 miles, its extreme width from Sheerness to Dungeness 35 miles, and its area 1,570 square miles. The surface is undulating, as the North Downs, a chalk range of from 3 to 6 miles in breadth, traverses the district from S.E. to N.W. Below this, towards the Sussex border, stretches the Weald, once a vast forest and still retaining much timber, but bearing good crops of cereals and roots in a marly soil. Further S. the expanse of Romney Marsh is only suitable for pasture, and supports great numbers of sheep. The whole of this tract is drained only by small streams, such as the Rother, the Eden, the Teise, the Bealt, and the Little Stour. N. and E. of the Downs, rich deposits of alluvial soil occur in the valleys of the Thames, the Medway, and the Swale, and their fertility has won for the neighbourhood its title of the "Garden of England." The Stour valley is also fairly productive, but the soil of the Isle of Thanet is light, and at Sandwich the chalk downs begin. Hops and fruit are largely cultivated in the central districts. Manufactures are few, cement and bricks on the Medway, and paper on that and other rivers being the chief; but ship-building is carried on at various points, and the Government works at Woolwich, Greenwich, and Chatham employ many hands. Deep-sea and shore fishing yield considerable profits: Ramsgate, Dover, and Rye, maintaining large fleets of smacks. The traffic with the Continent through Dover and Folkestone is another source of gain, and of late years Folkestone, Westgate, Hythe, and Deal, have grown into fashionable summer resorts, whilst Margate retains its old popularity. Railway communication is provided by the South-Eastern and London, Chatham and Dover lines with their branches. [MAIDSTONE, CANTERBURY, CINQUE PORTS.]

Kentigern, or ST. MUNGO, the son of a British or Culdee prince, is said to have been born somewhere N. of the Forth about 514. He received his education at the monastery of St. Serf, near Culross, and became a missionary preacher on the spot now occupied by Glasgow, where he became bishop. The jealousy of the local sovereign forced him into exile, and, settling in Wales, he founded the see of St. Asaph; but, being recalled about 560, he began the building of the cathedral, and ministered there until his death in 601.

Kentish Fire, a slang phrase for the expression of approval by clapping of hands and cheering. The exact origin of the expression is doubtful, but it is said to be derived from the sustained uproar by which Kentish opponents of the Catholic Relief Bills expressed their feelings at political meetings (1828 and 1829).

Kentish Glory, the nearest English ally of the silkworm. It is a moth about two inches across; the fore wings are brown. The hind wings of the male are yellowish, and those of the female

white with brown spots. The caterpillar lives on the birch. Its name is *Endromis versicolor* (Linn.).

Kent's Cavern, or HOLE, a cave situated in a small limestone hill near Torquay, in Devonshire. The bottom of the cave is formed of layers of stalagmite, red earth, and breccia, in which are found bones of various animals, such as rhinoceros, reindeer, wolf, and lion, as well as implements of flint and bone. There is also a layer of charred wood where, it is supposed, the early inhabitants of the cave had their fires. It was first explored for scientific purposes in 1825, but received little attention till 1864, when it was explored by a committee of the British Association under the direction of Mr. Pengelly, at a cost of over £1,900.

Kentucky, one of the United States of America, lying between Ohio, Indiana, and Illinois to the N., Missouri to the W., Tennessee and Virginia to the S., and Virginia and West Virginia to the E., with an area of about 40,000 square miles, the length from E. to W. being 458 miles, whereas the greatest breadth, N. to S., is only 171 miles. The surface consists of a great plateau sloping easily down from the Appalachian range on the S.E. to the valleys of the Ohio and Mississippi on the N.W. The highest portions (Pine Mountain and Cumberland Range) do not much exceed 3,000 feet, and the lowest level attained is about 600 feet. The flats on the margin of the Ohio are mostly covered with wood, but a strip of excellent soil, "the Blue Grass region," extends right through the centre of the state, and reaches its maximum fertility beyond Green River. To the N.E. and S.W. of this belt lie great coalfields. All the rivers—among them being Big Sandy, Licking, Kentucky, Salt, Green, Cumberland, and Tennessee—flow N.W. to the Ohio, and in some cases have cut their way deep through the limestone rocks, forming remarkable caverns, of which the Mammoth Cave is a renowned specimen. There are, too, many subterranean streams. Almost every kind of vegetable produce is grown, including cotton, tobacco, maize, and fine fruits. The breeding of horses and cattle is, however, a still more profitable occupation. The vast forests covering more than half the state yield much valuable timber. Coal is worked profitably, and the iron ores are of good quality, whilst petroleum has recently been obtained in considerable quantities. Frankfort is the capital, but Louisville is the most important and Lexington the oldest of the towns, among which Covington, Newport, Paducah, and Maysville deserve mention. Originally part of Virginia, Kentucky became independent in 1789, and was admitted to the union three years later. Schools are well organised and supported, and the railway system has developed widely since 1870.

Keokuk (THE GATE CITY), an important commercial centre, being the capital of Lee County, Iowa, U.S.A., is situated on high ground above the Mississippi, 2 miles N. of the confluence of the Des Moines river. Seven railways meet here, and a canal to avoid the rapids secures convenient water carriage, and so a great business in pork and other western products has grown up in the last fifty

years. It is built chiefly of brick, and has spacious streets, fine public buildings, and a medical school.

Kepler, JOHN, was born of noble but needy parents at Weil, a little town of Würtemberg, in 1571. He was a delicate seven-months' child; but in spite of disease and family troubles, he acquired some rudiments of learning, and the Duke of Würtemberg sent him to school, whence he passed to the university of Tübingen. Here he fell under the influence of Moesthin, a strong Copernican, and wrote a treatise to prove the diurnal rotation of the earth upon its axis. In 1593 he became Professor of Astronomy at Grätz, and, his attention being directed to the apparent want of any system in the relative size of the planets and their orbits, he spent some years in fruitless endeavours to determine the ratios that they bore to one another. The rather fanciful results of his investigations were published in 1596, and attracted the notice of Galileo and Tycho Brahe, the latter of whom offered him a sort of partnership at Prague, the Emperor Rudolph of Austria guaranteeing the expenses. The two then set about compiling the *Rudolphine Tables*; but Tycho died, and the Imperial promises were not kept, so that Kepler reverted to his former labours, and brought out in 1609 his *Astronomia Nova*, in which, from his observations of the planet Mars, he deduces that the orbit is elliptical, and that the radius-vector between the sun and the planet describes equal areas in equal times. In 1619 he gave to the world his third and most important law—viz., that the squares of the periodic times are proportional to the cubes of the mean distances between the planets and the sun. The *Harmonia Mundi*, enunciating this discovery, was dedicated to James I. of England, who in vain invited him to cross the seas. War, sickness, and the difficulty of getting his salary made his life wretched, and the death of his wife just as he obtained a professorship at Linz added fresh troubles. He worked on, however, effecting great improvements in the Galilean telescope, and bringing out in 1618 the first part of his *Epitome Astronomica Copernicana*, followed in 1628 by the *Rudolphine Tables*. The Duke of Friedland now became his patron, and he settled with his new wife at Sagan, filling the chair at Rostock. A journey to Ratisbon in 1630, in the hope of recovering the arrears of salary, brought on a fever, and he died of an abscess on the brain. Kepler's work amounted to thirty-three printed and twenty-two manuscript volumes, touching upon and illuminating every branch of cosmical science.

Kepler's Laws relate to the motions of the planets. The first two appeared in one of his writings published in 1609 at Prague, and the third one in 1619 at Augsburg. 1. The planets move in elliptical orbits with the sun in one focus. 2. In the motion of a planet round the sun the radius-vector (the line drawn from the sun to the planet) sweeps out equal areas in equal times. From this it follows that the velocity of the planet must be greater when it is nearer to the sun than when it is farther off. 3. With regard to different planets, the squares of their periodic times (the times taken

to go once round their orbits) are proportional to the cubes of their mean distances from the sun—the mean distance from the sun being taken as half the length of the major axis of the ellipse. Since the discovery of the universal law of gravitation, Kepler's second and third laws have been mathematically deduced from the first. Previous to the time of Kepler it had been considered that the planets moved in circles round the sun with uniform velocity; hence these brilliant discoveries practically formed the basis of modern astronomy.

Keppel, HON. AUGUSTUS, first Viscount, naval officer, was born in 1725. He went round the world in the *Ceuturion* with Anson, and in 1744 was made commander, and, later in the same year, captain. He was present at the battle of Quibéron Bay in 1759, and assisted in the reduction of Belleisle. In 1762 he became a rear-admiral, and as such served in the West Indies, and in 1765–66 at the Admiralty. In 1770 he attained the rank of vice-admiral, and in 1778 that of admiral; and, in the last-mentioned year, soon after taking command in the Channel, he fought on July 27th an indecisive action with the Comte d'Orvilliers, off Ushant. In consequence of this he was tried by court-martial on charges of misconduct preferred against him by his second in command, Sir Hugh Palliser, but was honourably acquitted. In 1782 he was created Viscount Keppel and First Lord of the Admiralty. He died in 1786.

Ker, or CARR, ROBERT, Viscount Rochester and Earl of Somerset, a member of the family of the Kers of Fernihurst, began life as a page to the Earl of Dunbar, but was taken to London by Sir Thomas Overbury, and introduced to James I., in whose service he rose rapidly. He married the profligate Countess of Essex, and both he and his wife were tried for the murder of Sir Thomas Overbury in 1615, George Villiers now having taken the place of his predecessor in the royal affections. Though their guilt was proved, the fear of discreditable revelations induced the king to let them escape and even grant them a pension of £4,000 a year. Their agents, however, were executed. The Earl of Somerset died in 1645.

Keratitis, the term applied to inflammation of the cornea of the eye. The disease occurs in several forms; *vascular keratitis* tends to involve a large portion or the whole of the surface of one or both corneæ, and may leave behind it considerable opacity with serious impairment of vision. The conjunctiva is affected, but the fact that something more than mere conjunctivitis is present is borne evidence to by the existence of what is known as a *circum-corneal zone*, a ring of congestion immediately surrounding the cornea in the sclerotic coat. Rest of the affected eye, cold applications, use of atropine, and counter-irritation are indicated; astringents should be withheld, and herein lies the importance of not confounding the condition with one of conjunctivitis. *Interstitial keratitis* occurs in children who are affected with inherited syphilis; this disease is associated with a peculiar condition of the teeth, and sometimes with deafness.

Suppurative keratitis is a very destructive disease, and produces great impairment of vision in the affected eye.

Keratoza, the group of horny sponges including those in which the skeleton is formed of fibres of spongin (or keratode). It includes the ordinary sponge of commerce. [SPONGE.]

Kerbela, or MESHED HOSSEIN, a town in the pashalic of Bagdad, Asiatic Turkey. It is situated on an old canal from the Euphrates about 60 miles S.W. of Bagdad, and 28 miles N.W. of the ruins of Babylon, and is enclosed within a wall with five gates. The mosque and tomb of Hossein or Hassan, son of Ali, the saint of the Shiite sect, attracts hither large Mohammedan pilgrimages.

Kerguelen's Land, or THE ISLAND OF DESOLATION, lies in lat. $49^{\circ} 54'$ S., long. $70^{\circ} 12'$ E., in the Indian Ocean, deriving its name from the French navigator who discovered it about 1772. It has a length of 100 miles, with an extreme breadth of 50 miles, and is rocky and sterile, but contains coal of some value. The coast is deeply indented, Christmas Harbour affording safe anchorage.

Kerman (KARAMANIA), a province of Persia, bounded by Khorassan and Afghanistan to the N. and N.E., Baluchistan and the Persian Gulf to the S.E. and S., and Laristan and Fars to the W. The area is about 60,000 square miles, much of the northern portion being a barren waste covered with saline incrustations. In other parts cotton, madder, saffron, tobacco, gums, fruit, and attar are produced in abundance. The hair of the goats and camels and silk are, however, the most valuable articles of commerce, and fine fabrics, shawls, and carpets are manufactured. Iron, copper, and sulphur are worked. Moghistan, the coast district to the E., belongs to Muscat.

Kerman, GHIRDJAN, or SIRJAN, the capital of the above, was formerly an important town strategically and commercially, standing in a plain among the mountains due N. of Murgab, and being protected by two hill-forts. It suffered, however, severely from the siege and subsequent sack by Aga Mahomed Khan in 1794, and has never recovered, though it still has some trade and a few industries.

Kermanshah, the capital of Persian Kurdistan, is on a tributary of the river Kerkhah (Choaspes). 280 miles S.W. of Teheran, in the province of Irak-Ajemi. It is fortified with a brick wall and towers, and the bazaars are well supplied. Fruit and cotton are grown and exported to Bagdad, as the town is on the caravan route between Persia and Turkey. Carpets and swords are the principal manufactures.

Kermes Mineral, a compound consisting of the sulphide of antimony (Sb_2S_3) mixed with varying quantities of the oxide (Sb_2O_3) and obtained by boiling ordinary sulphide of antimony with sodium carbonate or other alkali. It was formerly very largely employed and greatly prized for medicinal purposes, for which it is still used to a small extent.

Kernel, a popular term for the seeds (q.v.), especially when large and edible, in nuts and stone-fruits.

Kerner, ANDREAS JUSTINUS, was born at Ludwigsberg in Würtemberg in 1786, and was educated for the medical profession at Tübingen. He settled at Weinsberg, and in the intervals of practice amused himself by lyric compositions, which had a great success. Chief among these are *Travelling Shadows by the Magic-lantern Player*, and *The Visionary of Prevorst*, wherein he dealt with the phenomena of animal magnetism. He died in 1862.

Kerosene is a mixture of hydrocarbons, obtained as one of the products in the refining of crude petroleum, being that portion which distils over between the temperatures of 150° and 300° C. It is thus obtained as a colourless inflammable liquid of specific gravity .8, largely employed for purposes of illumination.

Kerry, a county in the province of Munster, Ireland, occupying an area of 1,810 square miles, in the extreme S.W., being bounded W. by the Atlantic, N. by the estuary of the Shannon, S. and E. by Cork and Limerick. The coast is broken by the bays of Tralee, Brandon, Kenmare, Dingle, and Ballynaskelligs, and dotted with islands, among which is Valentia, the starting point of some of the Atlantic cables. The surface to the S.W. is very mountainous and picturesque, Cairn Tual, the highest point in Ireland, attaining 3,404 feet. Further N. the soil in the valleys is rich, and, though the moist climate is unfavourable to cereals, other produce is abundant. Almost everywhere the rich pasture supports herds of the famous Kerry cattle. Lakes are an interesting feature of the county, and those of Killarney draw by their beauty crowds of tourists. Loughs Cara, Kittane, and Currane are also worth notice. The Blackwater is the chief river, but there are many others, such as the Ruaughty, the Laune, the Flesk, the Inny, and the Feale. Minerals are but partially worked, and coal occurs in thin seams only. Flags and slates are exported in some quantities. Fishing gives employment to a large number of the coast population.

Kersey, a diagonal-ribbed strong woollen cloth. As a rule it is coarse, and is only used for those parts of liveries where there is most wear. The principal places of manufacture are the north of England, Germany, and France. A very fine make of Kersey is called Kerseymere or Cassimere.

Kertch (anc. PANTICAPÆON), a seaport and fortress in the government of Taurida, European Russia, at the E. extremity of the Crimea, and overlooking the Straits of Yenikale or Cimmerian Bosphorus. Founded in the 6th century by a colony from Miletus, the town became the centre of the kingdom of the Bosphorus, but was conquered by Mithradates, and ruled by kings until the 4th century, when it was annexed to the Eastern Empire. Later it was held by various Slavonic barbarians, and was ceded by the Tartars to the Genoese, who established a thriving commercial

settlement. The Turks held it from about 1500 to 1771, since which date it has been in the possession of Russia. Its importance then diminished, and it suffered through its capture by the allies in the Crimean War. There is still, however, a considerable export trade in corn, hides, and Russian produce, whilst to the archæologist the place will always be deeply interesting, though the famous museum was removed in 1854. The church of St. John, dating from 717 A.D., is a remarkable specimen of Byzantine architecture.

Kestrel (*Falco tinnunculus*), a common British raptorial bird, migrating southward in winter. The adult male is about a foot long,



KESTREL (*Falco tinnunculus*).

reddish-brown marked with black above, light rufous spotted with black below; head, neck, and rump, bluish-grey. The female is slightly larger, and has reddish plumage barred with black. The kestrel is also called the windhover, from its balancing itself in the air by the rapid motion of its wings, and stannel (said to be a corruption of stand-gale) because it always keeps its head to the wind. Kestrels are decidedly farmers' friends, for they prey chiefly on mice and insects. There are many closely allied forms, sometimes separated from the genus *Falco*, and placed in a separate genus or sub-genus, *Tinnunculus*.

Keswick, a market-town of Cumberland, on the river Greta and the London and North-Western Railway, 22 miles S. of Carlisle. Its proximity to Skiddaw and Derwentwater, and its connection with the Lakists, especially with Southey, make it a favourite resort of tourists. The town is trim and prosperous, and possesses a handsome Early English church. Woollen goods and agricultural implements are still made here, but the manufacture of lead pencils has dwindled since the exhaustion of the Borrowdale plumbago mine. The char fishery affords employment to the boatmen on the lake. At the neighbouring village of Crosthwaite is the grave of Southey.

Ket, or KETT, ROBERT and WILLIAM, two brothers who carried on the business of tanners at Norwich, and put themselves at the head of the

movement against the enclosures of land and the spread of Protestantism during the rule of the Protector Somerset. They were men of ability and character, keeping their followers under considerable discipline. After defeating the Marquis of Northampton, they were routed and captured by Lord Warwick in 1549, and both were hanged on the Tree of Reformation, beneath which they held their tribunal.

Ketchup, CATCHUP, KATSUP, CATSUP, a name given to several sauces which are used with meat, fish, etc. Amongst the most common are mushroom, tomato, and walnut ketchup.

Ketones are a class of organic compounds, characterised by the presence of a CO group united to two hydrocarbon radicals, as, *e.g.*, $C_2H_5 \cdot CO \cdot CH_3$ ethyl methyl ketone. If two such groups be present we obtain *diketones*, etc., many of which compounds are important in pure chemistry. *Ketones* may in general be prepared by the distillation of the calcium salts of organic acids as exemplified in the case of the simplest ketone—dimethyl ketone ($CH_3 \cdot CO \cdot CH_3$) or *Acetone* (q.v.)



If oxidised the ketones generally break up, yielding a mixture of acids, or of acids and other simpler ketones.

Kettering, a market-town of Northants, 13 miles N.E. of Northampton, on the Midland Railway. Its market privileges date from Henry III., and the church of SS. Peter and Paul affords a good example of the 15th century Perpendicular style. There are a town-hall, an endowed school, and other public institutions. Boots and shoes, brushes, clothing, agricultural implements, and velvet are the staple manufactures, iron being also worked in the neighbourhood.

Kew (originally KAYOUGH), a village in Surrey, standing on the S. bank of the Thames 6 miles from Hyde Park Corner, and connected with London by several lines of railway and by steamboat services. It has thus become a favourite place of suburban residence, the fashion having been led by Frederick, Prince of Wales, who leased Kew House, which was purchased in 1789 by his son George III., and pulled down to make room for quarters for his children. The Botanical Gardens had been started before this by Lord Capel, and were improved by the Aitons and Sir Joseph Banks. In 1840 the nation took them over. With appurtenances they cover 270 acres, and are of great scientific interest. Kew Palace is never used now, but the Duke of Cambridge and other members of the Royal Family still occupy occasionally Kew Cottage, and the quaint church on the Green has been the scene of several royal weddings. A fine stone bridge connects Kew with Brentford.

Key, or KI, the name of a group of islands in the Indian archipelago. It is situated 50 miles W. of Arru islands, and 70 miles S.W. of Papua in lat. $5^\circ 30' S.$, long. $128^\circ E.$, comprising the Great and Little Keys, Verdool, Keywatela, Ketember, and a few other insignificant islets. The exports are

trepan, tortoiseshell, and birds'-nests. Vegetation is very luxuriant.

Key, in *electricity*, is an instrument used for opening and closing circuits conveying small currents. An elastic strip of brass is fixed to a base at one end, and has a platinum point and an insulating button at the end. By pressing the button the point can be put into contact with a fixed stud, also tipped with platinum. Wires are attached to the strip, and the studs can thus be connected with or disconnected from each other at pleasure. In some keys two fixed contact pieces are provided, one above and one below the strip; the latter can then be brought into connection with either, thus connecting one wire with either of two others. The Morse telegraphic key serves the same purpose, but has the two contacts not one above the other, but at opposite ends of a lever pivoted near the middle. Double contact keys are used in testing for charging and discharging condensers, etc. Reversing keys, used with single needle, mirror, and syphon recording telegraph instruments, have two double contact keys on the same base. The two top contacts are connected together and to one pole of a battery, the two bottom contacts being connected to the other pole; the two levers are connected to line and earth or to some instrument. When both levers are up the battery circuit is open, but a current may be sent in either direction by pressing one or other of the buttons. In plug keys a conical hole is drilled in a plate of brass, which is then divided by one or more saw cuts passing through the centre of the hole; the pieces, being screwed to a base-board, may be connected or disconnected by inserting or withdrawing a taper plug which fits the hole.

Keyhole Limpets, or *Fissurellidæ*, a family of univalve Mollusca (Gastropoda), of which the shell is low and conical in form; it differs from the true limpets by the fact that the apex of the shell is perforated by a keyhole-shaped aperture.

Keyne, ST., a pious Cornish virgin, said to have flourished at or near Liskeard towards the close of the 5th century. Her name is preserved in an ancient church and a well, the waters of which possess remarkable virtue. They confer supremacy in married life on whichever of a newly-wedded couple is the first to drink them. The legend is referred to by Fuller, and Southey made it the subject of a jocular ballad. It is given in detail by Cyrus Redding.

Keys, THE, or CAYS, a local name given to a number of low, sandy islands or reefs dotted about off the coast of Honduras, in the Bahamas, and as far north as the Florida side of the Gulf of Mexico. There is also a group so called in the Eastern Archipelago (*see above*).

Key West, one of the Florida Keys, lies 60 miles S. of the extremity of Florida, and possesses a good climate and fertile soil. Here is built Key West City, one of the most important military stations of the United States. Fort Taylor protects the harbour. Salt is made here in large quantities.

cigars are manufactured, and turtles are exported. The wrecks that constantly occur on the dangerous shoals give employment to the seafaring inhabitants.

Khami, a hill tribe, Upper Kuladen Valley, Arakan; a branch of the Burman race who have preserved their primitive customs and the worship of spirits and ancestry. They are skilful and industrious agriculturists, supplying tobacco, cotton, sesame, and other produce to the lowlanders. The Khami have a curious unwritten legal code, according to which all crimes may be punished by temporary or permanent slavery. Women have no rights, and are regarded as mere chattels owned by father, brother, or husband. The national name *Khami*, meaning "Men," has been changed by the lowlanders to *Kwe-myi*, "Dog-tails," in reference to an appendage to their costume.

Khampas, a group of Tibetan tribes now settled in the western province of Gnari-Khorsum, but originally from Kham (East Tibet), whence their name *Kham-pa*, "People of Kham;" not to be confounded with their present neighbours the *Khambas*, from whom they differ in many respects. They are a robust, well-made people, armed with guns and swords, and great marauders. They wear a *pontis*, or short sheepskin tunic, woolly side in, reaching to the knees, and attached with a woollen girdle. The men shave their heads, leaving only a queue like that of the Chinese, whereas the women let it grow to a great length, plaiting it in tresses interwoven with coins and silver ornaments. Both sexes are constantly in the saddle, either raiding or pursuing the antelope and wild sheep. All are Buddhists, like most Tibetans; but the language differs greatly from the standard Tibetan, the roots being the same, while the prefixes and suffixes are altogether different. (H. Trotter, *Account of the Pundit's Journey in Great Tibet. Journal of the Royal Geographical Society*, 1877.)

Khampti (KHAMTI), a semi-civilised people of both slopes of the Patkoi range between the Brahmaputra and Irawady, and in the Sudiya district, Assam; are of Shan stock, originally from the Bor Khampti country about the headwaters of the Irawady; remarkably fair complexion, and in physique superior to all the surrounding peoples: are nominal Buddhists, possessing some culture; all read and write their Shan dialect and often Burmese, both languages being written in the Burmese character; endless tribal groups, each with its *gohain* (chief) and separate villages, and each known by the pattern of the men's waist-clothes. (T. T. Cooper, *The Mishmi Hills, passim*.)

Kharkov, a government of South Russia, forming a district of the Ukraines, and extending from 48° 30' to 50° 12' N. lat. and 34° 20' to 38° 20' E. long., with an area of 21,035 square miles. It consists of a plateau of medium elevation belonging to the Great Steppe, and is watered by the Donets, an affluent of the Don and its tributary the Oskol. The soil is fertile, and large quantities of grain and wine are produced; horses, cattle, and sheep are also extensively reared. The capital, Kharkov, 465 miles S. by W. of Moscow by rail, is the seat of

a bishop of the Greek Church, and is noted for its university, established in 1805, which has a library of nearly 60,000 volumes, a botanical garden, an observatory, etc. The restrictive measures adopted by the Government in consequence of the Nihilistic tendencies of the students have greatly impaired its educational efficiency. The fairs for cattle and wool are famous, and soap, candles, and sugar are manufactured.

Khartoum, the most populous town of the Eastern Soudan, is situated a little above the union of the Blue and the White Nile, 445 miles S.W. of Suakim. It is situated on the great caravan route to Central Africa, and has long been notorious as a centre of the slave trade. During the war with the Mahdi (1884-85) it was gallantly held by General Charles George Gordon (q.v.), who was slain, with the rest of the garrison, two days before the arrival of an army of relief (Jan. 26, 1885).

Khas, a term originally meaning "Men," but now applied by the Siamese and Laotians to all the wild tribes of the border ranges; in this sense it answers to the *Moi* of the Annamese and the *Penong* of the Cambojans. But it is a word of too general application to have any ethnological value. There are Khas tribes everywhere in Indo-China, and the term enters into the composition of an immense number of tribal names, not only in this region, but also in South China and North-East India.

Khas, KHOS, a group of wild tribes of North Laos, in the mountains near the Mekhong river, north of Luang Prabang. They regard themselves as originally Chinese from the Tien-tsang Hills, Ta-li district, although MacLeod affiliates them to the Kuy of Camboja. The type appears to be more Chinese than Annamese, and they shave their head, leaving a pigtail in the Chinese fashion. They have a large number of silver ornaments chased with great skill and taste.

Khási and Jaintià Hills, an administrative district under the Chief Commissioner of Assam, covering 6,157 square miles, of which 2,160 square miles are British territory. The surface is a series of grassy plateaus. Limestone, lime, oranges, and potatoes are exported in large quantities to Bengal. The headquarters are at Chillong.

Khas-mu-tse, aborigines of Indo-China, numerous especially in the Kuy-Cheu uplands and in the Mekhong Valley about Muong Lini, on the frontier of Siam and Burma. Their language, distinguished by its harsh and hissing sounds, differs altogether from that of the surrounding Lao (Shan) peoples, and Colonel Yule thinks they may be of the same stock as the Miao-tse of South China. (Fr. Garnier, i., p. 369.)

Khassia (KOSSYAH), a large nation of South Assam, left bank of the Brahmaputra; of Tibeto-Burman stock, but speaking a distinct monosyllabic language, which presents several peculiar features; five well-marked dialects spoken by about 150,000 *Khyi*, as the Khassias call themselves. They form a group of petty states occupying the whole of the

Khassia Hills, each under an elective chief, and all recognising the supreme authority of the Chief Commissioner of Assam, who resides at Chillong in their territory. The Khassias are still for the most part Nature-worshippers, rejecting the Brahmans and their system of castes. The dead are buried under dolmens or cromlechs formed by four monolithic uprights supporting a fifth slab placed horizontally. The whole country is dotted over with groups of such monuments, which occur also in the neighbouring Jaintià and Naga Hills, and which are strictly analogous to the prehistoric monolithic monuments of Mauritania, West Europe, and Britain.

Khassonkés, a Negroid people of Senegal, who are a branch of the Soninkés of Mandingan stock. They occupy the Khasso district (whence their name), and extend along the Senegal river between the Faleme confluence and Bafulabé. Two main divisions—*Gadiagas* on the left and *Guidimakas* on the right bank of the river. The Khassonkés are generally regarded as the result of crossings between the Soninkés on the one hand and the Berbers and Fulahs on the other.

Khataks, a large division of the Afghan people in the southern part of the Peshawur district and in Kohat. Three main branches—*Tari*, with six sub-groups; *Taraki*, with thirteen sub-groups; and *Bolak*, with nine sub-groups; total population, about 100,000. The Khataks form a petty semi-independent state subject, not to the Emir of Afghanistan, but to the British rāj. Some have migrated to the Yusafzai territory farther north, where they form seven tribal groups, also subject to the English authorities.

Khátmádu, the capital of Nepal, is situated at the junction of the Vishnumati and Bághmatú rivers. The most conspicuous object is the Maharaja's palace, part of which is ancient. There are many fine temples.

Khatrans, a numerous people of Baluchistan, whose territory comprises the hills west of Dera Ghazi Khan. Four main branches—*Ganjura*, *Darival*, *Hasani*, and *Nahar*, with thirty-two minor groups, and collective population, 50,000 to 60,000. The Khatrans are a pastoral people, owners of large herds, and wealthiest of all the Baluch tribes.

Khedive, the French form of a Turkish title, equals "prince," "lord," adopted by the Viceroy of Egypt in 1867, by Ismail Pasha, after his office had been made hereditary by his suzerain, the Sultan of Turkey. The title is old, being mentioned by Purchas (1625) in the form *Quiteue*.

Kherson, a government of South Russia, extending over 27,515 square miles, and bounded by the Dniester on the W., the Dnieper on the S.E., and the Black Sea on the S. The southern portion forms part of the Great Steppe, but towards the north the surface becomes undulating. The northern and western districts are the most fertile. Cattle-rearing and agriculture are the principal industries. There are several German colonies. KHERSON, the capital, situated on the Dnieper, 19 miles from its

mouth, was founded by Prince Potemkin in 1778. The chief article of trade is timber; wool-cleaning is extensively carried on. John Howard, the philanthropist, died here.

Khiva, or KHARASM, a khanate of West Turkestan, situated between $37^{\circ} 45'$ and $44^{\circ} 30'$ N. lat., and $50^{\circ} 15'$ and 63° E. long., and comprising nearly 25,000 square miles, about four-fifths of which are a sandy desert. It is bounded on the E. and N.E. by the Oxus, which for a considerable distance divides it from Amu-Daria (formerly a part of the khanate, but now Russian territory), and at its N. extremity by the Sea of Aral. In the oases which are mostly situated near the Oxus, and irrigated by means of canals connecting them with the river, rice and other cereals, fruit and vegetables, grow abundantly. Of the numerous nomad races inhabiting Khiva, the most important is that of the Uzbeks, to which the family of the Khan belongs. The capital KHIVA, situated in the largest of the oases, is oblong in shape, and surrounded by a double wall. With the exception of three mosques, a school, and a caravanserai, the houses are constructed of mud. The designs of Russia against Khiva culminated in 1873, when the district of Amu-Daria was annexed, and the remainder of the khanate was placed under Russian suzerainty.

Khmer. [CAMBOJANS.]

Khmu, a wild tribe of North Siam, in the hilly district between Vien-Shan and Luang Prabang. They are the Kamu and Kamet of MacLeod, and appear to be a remnant of a large nation including the Khas, Mis, Does, and Lemets, whose domain was invaded and broken into fragments by the Laotians at some remote epoch. All these speak a language offering merely dialectic differences, but quite distinct from that of the Laotians and Siamese.

Khoi, a Persian town, in the province of Azerbijan, 75 miles N.W. of Tabriz, on the road to Erzeroum.

Khojars, a branch of the Mohmand Afghans, who occupy the northern slopes of the hills along the left bank of the Kunar river, Kunar district; eight divisions, besides those on the southern slopes of the same mountains, who are not subject to the ruler of Kunar. (MacGregor, *Afghanistan*.)

Khojend, a town of Russian Turkestan, on the Sir-Daria, in the government of Ferghana, 75 miles S. by W. of Khokand. It is surrounded by a wall and fosse. Khojend was seized by the Russians in 1865.

Khokand, the capital of the ancient khanate of the same name, lies in the Ferghana valley, 10 miles S. of the river Sir-Daria. There are mosques, bazaars, schools, and other public buildings, and a large trade is carried on in cotton and grain, grown in the neighbourhood. The immediate vicinity of the city—where the soil, originally sterile, has become fertile through irrigation—is occupied chiefly by fruit-gardens. Since its annexation to Russia, the khanate has formed the government of Ferghana.

Khonds, aborigines of East Central India, chiefly in the Orissa Hills, with two groups (Kochriah and Paharia) in Sambalpur, are now of Dravidian speech like the Gonds, to whom they seem closely akin. Both terms simply mean "Hillmen" in Telugu. Three chief branches: *Bettiah*, servile tribes in the forests below the Ghats; *Benniah*, free and settled tribes on the wooded skirts of the hills; and the independent *Khonds* of the central tableland of the Ghats; average height, muscular frame, high cheek-bones, nose broad at tip and sometimes arched, full lips; clear glossy skin, ranging from a light bamboo to a deep copper shade; intelligent, pleasing expression; spirit worshippers. (Captain Macpherson in *Calcutta Review*, v. p. 41.)

Khorassan, the largest province of Persia, now lies between 34° and 38° N. lat., and 53° and 61° E. long., and has an area of about 210,000 square miles. It is bounded by Turkestan on the N., Afghanistan on the E., the province of Irak-Ajemi on the E., and those of Faristan and Kerman on the S. A large part of the surface is occupied by a vast salt desert, and elsewhere sandy plains abound, but the mountain ridges on the N. side, in the districts of Meshed and Astrabad, are cloven by many fertile valleys, in which grain, cotton, rice, hemp, tobacco, and other products are grown. There are mines of gold, silver, turquoises and other precious stones, and salt. The principal towns are Meshed and Nishapur.

Khostwals, a branch of the Afghan nation Upper Khost Valley, north-west frontier India, appear to be originally of Mongol stock like the neighbouring Banuchis and Dawaris; ten divisions, with collective population 12,000.

Khotan, a district and city of Eastern Turkestan, situated on the N. side of the Kuen-Lun Mountains. The chief articles of trade are the jade ware and silk stuffs manufactured in the district.

Khrumirs (KRUMIRS), a mixed Arabo-Berber people of the Tabarka Hills stretching inland from the sea between Algeria and Tunis, have acquired a historical reputation from the fact that their (alleged) predatory expeditions served as a pretext for the French occupation of Tunisia in 1881-82. They form a confederacy of one Berber (*Tademmak*) and three Arab tribes (*Selul*, *Meselma*, and *Shiaya*), capable of mustering altogether about 14,000 fighting men armed with muskets. The Khrumirs are a poor, degraded people, living in wretched hovels of branches and mud, the chiefs alone having stone houses, which, however, they share with all the animals of the farmyard. Some came traditionally from the West (Morocco), and claim descent from the renowned marabout (saint) Sidi Ali-bu-Jemel. (Duveyrier.)

Khurja, an important commercial town in the North-West Provinces of India, 50 miles S.E. of Delhi, exports raw cotton to Cawnpur and Calcutta.

Khuzistan, a province of West Persia, bounded on the S. by the Persian Gulf, area 29,325 square miles. The surface is hilly towards the N.E., but

the S.W. portion of the province consists of one vast plain. Cattle-rearing is the most important industry. Shuster and Dizful are the principal towns.

Khyber Pass, the chief opening in the Khyber Mountains, begins 10 miles W. of Peshawur, and extends 33 miles N.W. to the plain of Jelalabad. It is the only route between the Punjab and Afghanistan available for an army with baggage and artillery, and has afforded ingress or egress to numerous invaders from the time of Alexander the Great. The precipices on either side rise in some places to a height of over 3,000 feet. It was here that a British army was in 1842 almost annihilated by the Afghans whilst retreating from Cabul. By the Treaty of Gandamak (1879) the British authorities in India now exercise control over the pass.

Khyengs (KAYENS), aborigines of the Arakan-Yoma Mountains between Burma and Arakan, chiefly on the southern slopes east of the Khamis; are a northern branch of the Karens [KARENS] at a much lower stage of culture than the surrounding Burmese populations. Matriarchal customs still prevail, and till recently the young girls were tattooed all over the face in such a way as entirely to destroy the features. This was said to be done in order to protect them from the neighbouring tribes, by whom they were constantly waylaid in the forests and carried into captivity. The Kayens speak a distinct Karen dialect, and the tribal name itself appears to be merely the Burmese pronunciation of Karen; total population (1881) 55,500.

Kiachta, or KIAKHTA, a Russian town on the Chinese frontier, in the province of Transbaikalia, 165 miles S.E. of Irkutsk. The Chinese town of Maimatchin is in the immediate neighbourhood. From the Treaty of Nertchinsk in 1689 to that of Peking in 1860, by which Russian vessels were admitted to Chinese ports, Kiachta was the chief centre for the exchange of Russian and Chinese goods. The former are chiefly manufactured goods and furs, the latter silks, nankeens, porcelain, and, above all, tea.

Kiang. [DZIGGETAL.]

Kickapoos, North American Indians of Algonquian stock, former allies of the Foxes, with whom they encamped on the left bank of the Mississippi, between 40° to 45° N. lat. Later these were joined by the Utgamis, and in 1819 they voluntarily removed from the present state of Illinois to Kansas, where they occupy the township of Kickapoo, Leavenworth County. Here they turned to agriculture, and were noted for their well-tilled plots and neat farmsteads. At present (1893) the whole nation is reduced to about 760 souls, of whom 325 are in the Sac and Fox Agency, Indian Territory, and 235 in the Pottawatomie and Great Nemaha Agency, Kansas, while the rest have migrated to Mexico.

Kidd, WILLIAM, a noted pirate, was born about 1658 at Greenock, and, after having acquired con-

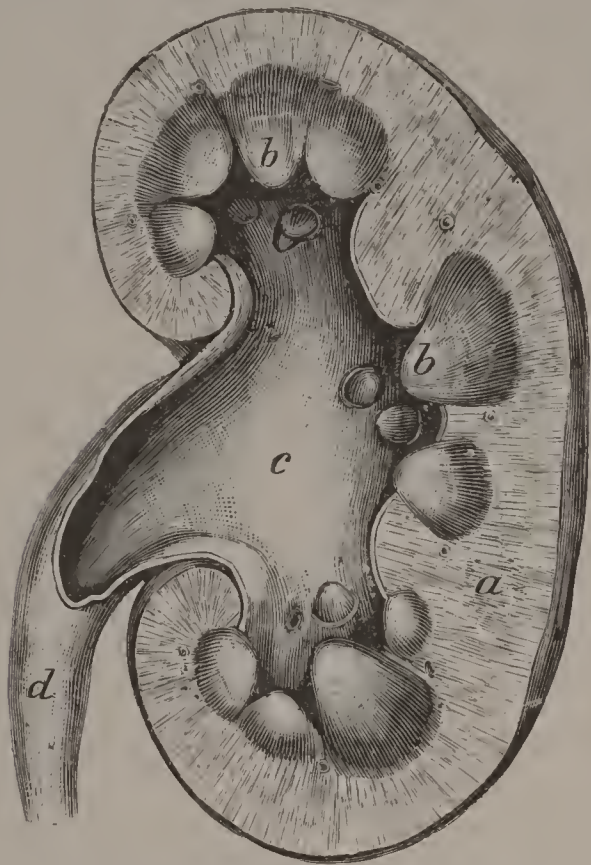
siderable experience in the East Indies, was pitched upon by a committee of noblemen and others to command an expedition, in the *Adventure* galley, against the pirates in those seas, with a commission under the Great Seal. Instead of doing his business, Kidd himself turned pirate, and went to the West Indies, where he committed many depredations. He was at last secured by the Earl of Bellamont, Governor of New England, one of his original employers, and was sent to England, where, after trial at the Old Bailey, he was, with several of his accomplices, executed and hung in chains on the banks of the Thames in 1701. What he did with his immense spoils has never yet been satisfactorily explained; but the popular belief is that he buried them, and that they still lie concealed.

Kidderminster, a market-town and municipal and parliamentary borough on the Stour, in Worcestershire, 14 miles N. of Worcester by railway. It is noted for its manufacture of Brussels and other carpets, established in 1735. The free grammar-school was founded in 1637. There are statues of Richard Baxter, vicar from 1641 to 1660, and Sir Rowland Hill, born here in 1795. Kidderminster was incorporated under Charles I., and has returned one member to Parliament since 1832.

Kidnapping. The forcible taking away of a man, woman, or child from their own country and conveying them into another. It was a capital crime by the Jewish and civil laws, and is punishable under the English common law. Abduction or detention of children is punished by penal servitude under 24 and 25 Vict. c. 100.

Kidney. The human kidneys, two in number, lie at the back of the abdomen, behind the peritoneal sac on either side of the spinal column, at the junction of the dorsal and lumbar vertebræ. Each kidney weighs a little less than 5 oz. There is an outer investing capsule, which envelops the gland and becomes continuous at the inner concave margin or *hilum* of the kidney with the outer coats of the vessels which enter the gland at that point. These vessels consist of the renal artery and vein and the ureter; down the last-named tube the urine secreted by the kidney passes on its way to the bladder. If the ureter be traced upwards, it will be found to expand on reaching the inner margin of the kidney into what is known as the *pelvis*. The *pelvis* divides into a number of little cups called *calyces*, each of which receives the pointed extremity of one or more pyramids of the kidney. If a longitudinal section be made through a kidney, it will be found to consist of an outer or *cortical* portion and an inner, which is called the pyramidal portion, being made up of some dozen little pyramids the apices of which abut as aforesaid upon the several calyces into which the *pelvis* subdivides. The kidney substance comprises the ramifications of innumerable minute tubules. These tubules commence by a blind extremity in the cortex of the kidney, pursue a tortuous course through the cortex, and then a straight course through the pyramids, which latter derive their striated appearance from being composed of bundles

of tubules. As the tubules approach the apex of each pyramid they open into a series of ducts known as collecting tubules, which empty themselves into the calyces. The tubules of the kidneys are lined throughout by a single layer of epithelial cells. These cells secrete from the blood a fluid,



LONGITUDINAL SECTION OF KIDNEY.

a, cortical portion ; *b*, pyramidal portion ; *c*, pelvis ; *d*, ureter.

the urine, which passes along the course of the tubules, finds its way into the calyces, and so into the pelvis of the kidney, and thence down the ureter into the bladder.

The character of the epithelial cells lining the tubules varies in different parts. It will suffice to direct attention, first, to the blind extremity of the tubule in the cortex, and, secondly, to those portions of the tubules which, from the wavy course they pursue through the substance of the kidney, are known as the *convoluted portions* of the tubules. At its extremity in the cortex each tubule expands, forming a kind of cap, which envelops a loop of capillary blood-vessels, forming what is known as a *glomerulus* or *Malpighian corpuscle*. These latter bodies may be seen with the naked eye as minute red points dotted over the cortex of the kidney. The little cap which envelops the loop of blood-vessels is lined with flattened epithelial cells, and certain fluid constituents of the blood find their way from the capillaries through the layer of epithelium, and reach the interior of the urinary tubule. In this manner it is supposed that the bulk of the water of the urine is abstracted from the blood. To pass now to those parts of the urinary tubules which are convoluted, here the epithelium is of the kind known as secreting epithelium, and, the convoluted tubule being surrounded by a close network of capillary blood-vessels, this secreting epithelium extracts from the blood certain of its constituents.

It is supposed that the more important constituents of the urine are secreted and passed into the system of tubules by the epithelium of these convoluted tubules.

It remains to say something concerning the peculiar arrangement of the blood-vessels of the kidney. The renal artery breaks up into a number of branches, many of which find their way towards the cortex of the kidney, and ultimately break up into a series of minute arterioles, each of which finally enters a Malpighian corpuscle. There the arteriole breaks up into the little cluster of capillaries which have been already alluded to as being invested by the blind extremity of a urinary tubule. The blood from these capillaries is collected again into a little vein which emerges from the Malpighian corpuscle at the point where the little arteriole entered it. This little vein, however, breaks up again into a second system of capillaries, which ramify around the convoluted portion of one of the urinary tubules ; the blood from this second system of capillaries is again collected into a little vein, which unites with other veins and finally empties itself into the renal vein, which passes out at the hilum of the kidney. It will thus be noted that there is a double system of capillaries in the case of the kidneys, one set of capillaries being found in the Malpighian corpuscle and another set investing the convoluted portions of the tubules. For diseases of the kidneys, see BRIGHT'S DISEASE.

Hæmaturia.—A stone or calculus is sometimes formed in the kidney, a serious condition which usually calls for operative treatment.

Surgical kidney is the term applied to the condition sometimes met with as the result of backward pressure caused by obstruction to the flow of urine through the urethra or bladder. The kidney may be affected by tubercular or malignant disease.

Kidney Bean. [FRENCH BEAN.]

Kidney Ore, a hard variety of *hæmatite* (q.v.), which is so named from the peculiar reniform shape of the ore masses, and which occurs largely in the Lancashire and Cumberland mineral deposits.

Kieff, a government of South-West Russia, bounded on the east by the Dnieper, and including a large part of the Ukraine, with an area of 19,685 square miles. The surface is flat, and towards the north covered with woods. Large crops of excellent wheat are raised, and the manufacture of beetroot sugar is carried on very extensively. The capital, KIEFF, picturesquely situated on the right bank of the Dnieper, 350 feet above the river, is one of the most ancient cities in Russia. It was the capital of the whole country from 882 to 1169, and the place where Christianity was introduced into Russia in 988. Kieff is now the seat of one of the four metropolitans, and is regarded as an especially sacred spot. Besides the Petchersk Monastery, with its subterranean tombs of saints and martyrs, which are visited by a vast number of pilgrims, and the two cathedrals of St. Sophia (1037) and the Assumption, it contains upwards of sixty churches, whose gilded domes and minarets

give the city, when viewed from a distance, a very brilliant aspect. The university was transferred to Kieff from Vilna in 1833. The Dnieper is here crossed by a magnificent suspension bridge, constructed in 1851. The city really consists of three contiguous but distinct towns—Kieff, Petchersk, and Podol—each of which has its own system of fortifications. The manufactures are unimportant, but there is a thriving trade, which has increased with the progress of Odessa.

Kiel, the chief naval port of Germany, lies at the head of Kiel Fiord, Holstein. It is the Baltic headquarters of the German navy, and possesses a naval academy and a university founded in 1665. The population is about 55,000. Both sides of the bay, in which there is spacious anchorage, are heavily fortified below the town, especially by the works of Priess, Falkenstein, Friedrichsort, Roepsdorf, Stosch, Jagerberg, Korügen, Heidberg, and Möltenort, and the place is almost impregnable. Opposite the town lies Gaarden, where there are extensive private shipbuilding yards. The Government yard is below the town of Gaarden, on the east bank. Kiel has a considerable trade, and is noted for its beer, pickled herrings, and sprats.

Kiepert, HEINRICH (b. 1818), geographer, born at Berlin, studied under Ritter. He was appointed director of the Geographical Institute at Weimar in 1845. and professor of geography at Berlin in 1859. Among his most important atlases are those of *Greece* (1840-46), *Palestine* (1846), and the well-known *Historico-Geographical Atlas of the Ancient World* (1848).

Kierkegaard, SÖREN AABY (1813-55), a Danish author, born at Copenhagen, wrote *Either-Or* (1843), *Stadia on Life's Way* (1845), and other philosophical inquiries into the principles of Christianity.

Kieselguhr is an earthy deposit consisting almost entirely of the siliceous remains of microscopic organisms—*diatoms* (q.v.). It occurs largely in white and grey deposits near Hamburg, and before being applied to its various uses is calcined in kilns built for the purpose. It is largely used as a polishing powder, in the manufacture of ultramarine and firebricks, while large quantities are employed for the manufacture of dynamite. [NITROGLYCERINE.]

Kieserite, hydrous magnesium sulphate ($MgSO_4 + 2H_2O$), is one of the minerals of which beds occur, associated with common salt, at Stassfurt (q.v.) in Saxony. It contains 29 per cent. of magnesia, 58 per cent. of sulphuric acid, and 13 per cent. of water. It crystallises in the prismatic system, but is generally massive. It is translucent and greyish-white, and its specific gravity is 2.52.

Kildare, an inland county of Ireland, in the province of Leinster, bounded by Co. Meath on the N., Dublin and Wicklow on the E., King's County and Queen's County on the W., and Carlow on the S.; area, 654 square miles. The surface is generally level, and the soil a productive clayey loam. The prevailing flatness is broken on the E.

border by offsets of the Dublin and Wicklow Hills, from 1,000 to 1,200 feet in height, and to the W. and N. of the town of Kildare by the Dunmurry and Red Hills and the Hill of Allen (676 feet), which rises abruptly from the Bog of Allen, a tract comprising about one-fifth of the entire county. The Boyne skirts the N.W., the Barrow the S.W. border, and the Liffey enters the county from Wicklow, afterwards curving round in a N.E. direction. Kildare is intersected by the Great Southern and Western Railway and the Grand Canal. Agriculture is the principal industry, but woollen goods and paper are manufactured to some extent. Rathes, round towers, crosses, and other antiquities abound.

Kildare, a town of Co. Kildare, 30 miles S.W. of Dublin. The original bishopric is said to have been instituted in the time of St. Bridget, who founded a monastery and nunnery here in the 6th century. The Protestant see is now merged in that of Dublin, whilst Kildare and Leighlin together form a single Roman Catholic diocese. "St. Bridget's Fire," after being kept alight for several centuries without intermission, was finally extinguished in the reign of Henry VIII. A portion of the abbey church or cathedral has recently been restored. In the churchyard there is a fine round tower (103 feet), with a modern superstructure, consisting of an embattled parapet.

Kilimanjaro, a mountain of East Africa, about 20,000 feet in height, situated in 3° 20' S. lat. and 37° 50' E. long., between Lake Victoria Nyanza and the sea. First ascended in 1889 by Dr. Hans Meyer and Herr L. Purtscheller.

Kilkenny, an inland county of Ireland, in the province of Leinster, bounded by Queen's County on the N., Carlow and Wexford on the E., Tipperary on the W., and Waterford on the S.; area, 796 square miles. The northern part of the county consists for the most part of wide tracts of moor or grassy uplands, used as pasturage for sheep and cattle; the centre is a large plain, broken by hillocks and swelling ground; whilst in the S. the surface becomes more hilly, reaching in many places an elevation of 1,000 or 1,500 feet above the sea-level. The climate is mild and favourable to agriculture, the most fertile districts being along the valleys of the Barrow and Suir, on the E. and S. borders respectively, and that of the Nore, which runs through from N.W. to S.E., where it joins the Barrow. The Castlecomer coalfield in the N. furnishes more than one-half the total amount of coal produced in Ireland. Black marble, slate, manganese, and other minerals are also found. Of the numerous antiquities the most noteworthy is the Castle of Graney, in the barony of Iverk, said to have been built by the Earls of Ormonde early in the 16th century.

Kilkenny ("Church of St. Canice"), the capital of Co. Kilkenny, is a parliamentary borough, on the Nore, 81 miles S.W. of Dublin by railway. St. Canice's Cathedral is an Early English building, the oldest part of which, the choir, dates from the close of the 12th century. Near the south transept there is a round tower, 100 feet in height. The

most noticeable feature of the interior is the beautiful groined vault under the central tower. There are also remains of several 13th-century abbeys. The Roman Catholic church is a fine building, consecrated in 1857. The castle, which stands on a rocky summit overlooking the Nore, was originally built by Strongbow, and rebuilt by his son-in-law, William Marshal, Earl of Pembroke, at the close of the 12th century. Three round towers and two walls belonging to the original structure remain. The castle was eventually purchased by the Butlers, and now belongs to the Marquis of Ormonde. At the Grammar School Swift, Congreve, and Berkeley were educated. In a Parliament held in this town in 1367 the Statute of Kilkenny was passed, forbidding intermarriage between the English and Irish, and placing other restrictions on the intercourse between the two peoples. After forming a centre of disaffection during the rebellion in 1642, the town was besieged and captured by Cromwell (1648-50). A trade in provisions is carried on with Waterford.

Killarney, LAKES OF, a group of three beautiful lakes situated in a basin at the northern foot of the lofty Kerry Mountains, in Co. Kerry (q.v.), Ireland. The Lower Lake, or Lough Leane, which is furthest to the N., is 5 miles long, with an average breadth of $2\frac{1}{2}$ miles; the Middle or Muckross Lake is 2 miles long by 1 mile broad, and the Upper Lake $2\frac{1}{2}$ miles by $\frac{3}{4}$ mile. The Lower and Middle Lakes are connected with the Upper by the Long Ranges, a winding stream with picturesquely wooded banks, $2\frac{1}{2}$ miles in length. In many places the mountains rise immediately from the shore of the lakes, and are covered with trees down to the water's edge; the islands also, with which the lakes are thickly studded, are richly wooded, and both here and along the margin there is a luxuriant growth of the *arbutus unedo*, an indigenous plant remarkable for its size and beauty, which is peculiar to this district. On the E. side of the Lower Lake is the peninsula called Ross Island, on which is Ross Castle, a quadrangular tower dating from 1500. Near the Middle Lake are the interesting ruins of Muckross Abbey, originally the monastery of Irrelagh, founded for the Franciscans about 1446 by the head of the McCarthy family, and restored in 1626. The little town of Killarney, $1\frac{1}{2}$ miles E. of the Lower Lake, is entirely dependent on the tourists who visit the district; the only object of interest is the Roman Catholic cathedral, designed by Pugin.

Killiecrankie, PASS OF, an approach to the Highlands on the Garry, in the county of Perth, 15 miles N.N.W. of Dunkeld. The plain above the pass was the scene of the victory and death of Claverhouse in 1689.

Killigrew, WILLIAM, THOMAS, and HENRY, three brothers, sons of Sir Robert Killigrew, who suffered much in the cause of Charles I., but were amply recompensed after the Restoration. Both Sir William (1606-95) and Thomas (1612-83), who from his familiarity with Charles II. became known as the "king's jester," were dramatists of note in

their day. Henry's daughter was the "Mistress Anne Killigrew" (1660-85) of Dryden's elegy, "excellent in the two sister arts of poetry and painting."

Kilmainham, a township of Dublin, adjoining the city. The Royal Hospital for disabled soldiers was founded by Charles II. There is a Government prison, in which Mr. Parnell and his colleagues were confined in 1882; the "Kilmainham Treaty," an alleged agreement between Mr. Gladstone and Mr. Parnell, was so called because it was said to have been formed during the latter's imprisonment.

Kilmarnock, a parliamentary borough in Ayrshire, on Kilmarnock Water. 24 miles S.S.W. of Glasgow. It is an important centre of the iron trade, and since 1855 has been famous for its annual cheese-fair. The manufactures include carpets, calicoes, tweeds, winceys, boots and shoes. The town has many associations with Burns, to whom a monument was erected in the Kây Park in 1879.

Kilogramme, the mass of one litre of pure water at 4° C.; 1,000 grammes = 2.205 lbs. [GRAMME.]

Kimberley, the capital of Griqualand West (q.v.), Cape Colony, South Africa, 540 miles N.E. of Cape Town by railway, has sprung up since the working of the diamond mines, which began in 1871, and is now a prosperous town, with many handsome buildings, including a town-hall, public library, etc. Nearly all the mines are now owned by the De Beers Consolidated Company, which has thus gained an almost complete monopoly of the diamond trade of the world.

Kimchi, DAVID (c. 1160-1235), a Jewish Rabbi, probably a native of Narbonne, equally famous as a Hebrew grammarian and lexicographer and as a commentator on the Old Testament. His brother, MOSES KIMCHI, was also a celebrated Biblical scholar.

Kimeridge Clay, named from the village of Kimeridge in the Isle of Purbeck (Dorsetshire), is an important division of the Upper Jurassic (q.v.), giving the name "Kimeridgian" to the series. It is a bluish-grey or sometimes yellow clay, generally shaly, containing beds of bituminous shale, lignite, crystals of selenite, septarian nodules, and, near its base, sandy beds with clay-ironstone. It is of marine origin, and has a maximum thickness apparently of 660 feet, passing conformably downwards into the Corallian, or, as in Bedfordshire, in the Fens, and in the Sub-Wealden boring near Battle, into clays continuous with the Oxford Clay. To these passage-beds the name Ampthill Clay has been given. The Kimeridge Clay is overlaid conformably by the sands and limestones of the Portlandian. The outcrop of the clay extends from Dorset and Somerset, through North Wilts, Oxfordshire, and the Fens, into Norfolk, Lincolnshire, and the Vale of Pickering, forming broad, flat areas of cold, stiff pasture-land. As the oak flourishes on this soil it was named "Oaktree Clay" by William

Smith, as by confusion were other clays. The pyrites in the bituminous beds has sometimes by its decomposition produced spontaneous combustion, as in the so-called "Volcano" in Ringstead Bay, which burnt for some years. The bituminous shales have been distilled for paraffin, and in prehistoric times a lignite, almost as lustrous as jet, was turned into ornaments near Kimeridge, where the wastrel of the lathe is still found and is known as "Kimeridge coal-money," being supposed to have been used as coin. The Kimeridge Clay has been subdivided into an upper and a lower division. The upper or Virgolian group of foreign authors, characterised by the small oyster, *Exogyra virgula*, consists of paper-shales, bituminous shales, cement-stones, and clays, best developed in the south of England. The lower or Astartian, with *Astarte minima* and *Ostrea deltoidea*, better developed in the north, is often sandy with ferruginous "doggers." Other characteristic fossils are *Ammonites biplex* and numerous saurian remains. On the Continent a middle division, or Pterocerian, with *Pteroceras oceanii*, is distinguished. The fine-grained limestone, long quarried for lithographic purposes at Solenhofen, near Munich, in which the oldest-known fossil-bird, *Archæopteryx* (q.v.), was found, together with numerous well-preserved saurian, insect, and other remains, belongs to the Kimeridgian.

Kin, Next of. [NEXT OF KIN.]

Kincardineshire, or THE MEARNs, a county on the E. coast of Scotland, bounded by Aberdeenshire on the N. and N.W. and by Forfarshire on the W. and S.W.; area, 383 square miles. The rivers Dee and North Esk flow along the N. and S. borders respectively. The mountainous district, consisting of the Grampians, which traverse the county from E. to W., is covered with forests and moors, but along the coast, and in the "Howe of the Mearns"—a continuation of the valley of Strathmore in the S. part of the county—the soil is extremely fertile. There are woollen and linen manufactures. Stonehaven (q.v.) is the chief town.

Kindergarten = "children's garden," the German name for a school for young children conducted on Froebel's system, which combines amusement with instruction and aims at keeping children interested and developing their powers of observation and elementary reasoning as well as their memory. The "object lesson" is an offspring of this system.

Kinematics is the study of motion. It does not investigate the cause which produces motion, but simply the space-relations from time to time, of the moving body. The more important motions are (1) uniform motion in a straight line when the speed is the same at every point, and the distance travelled is directly proportional to the time; (2) uniformly accelerated motion when the body starts from rest and increases its speed uniformly, the distance travelled from rest being in this case proportional to the square of the time and to the rate of change of speed; (3) uniform motion in a circle; (4) simple harmonic (q.v.) motion, which is an oscillatory motion about a point, with a varying acceleration that is always proportional to the

distance of the moving body from the centre. The propagation of a state of motion through a medium without actual transit of the particles composing the medium, is said to be produced by *waves*. The constituent particles oscillate about fixed positions, and transmit that condition of oscillation in all directions, with a speed that depends upon the elasticity and density of the medium.

Kinetics, the study of forces that are not in equilibrium. If a body be so small that the energy due to its rotation about any axis through its mass-centre be negligible, the investigation of the force relations on that body is simple. The body is treated as a particle, of no dimensions, though it is, of course, impossible for such a thing to possess finite mass. Forces acting on it are assumed to act at one point, and the condition of their equilibrium is that the force-polygon (q.v.) shall be closed. The resultant motion of the body is rectilinear when the forces are not in equilibrium, and is identical with that produced by a single force represented in magnitude, direction, and sense by the line closing the force-polygon. The body, therefore, is impressed with a uniform and constant change of speed. If the body be not small, the operation of summing up the effects of the impressed forces will not always be so simple. The motion of the mass-centre of the body will be the same as if all the forces were shifted to that point, parallel to their actual positions. If the sum of the moments (q.v.) of the forces about an axis through the mass-centre be zero, there will be no rotation about that axis; if the sum of the moments have a finite value, there will be a rotation about the axis, with an angular acceleration proportional to the sum of the moments. Without entering into fuller detail, it is obvious that even for bodies that do not admit of rapid change of shape, the kinetic investigations may become exceedingly complicated; and for problems on liquids, gases, and flexible or elastic solids, processes involving most abstruse mathematical implements are in most cases necessary. [DYNAMICS.]

Kinetite, a high explosive, consists of nitrobenzole thickened or gelatinised by the addition of collodion cotton, incorporated with finely-ground chlorate of potash and precipitated sulphide of antimony, and exists as an orange-coloured plastic mass. It needs a comparatively high temperature for ignition, cannot when unconfined be readily exploded by heat, and is little affected by water unless the immersion be prolonged; but it is very sensitive to combined friction and percussion, and deficient in chemical stability.

King, the surname of a distinguished Kentish naval family, of which SIR RICHARD, first baronet, was born in 1730, distinguished himself as commodore in Hughes's actions in the East Indies, was made a baronet in 1792 and port-admiral at Plymouth in 1794, and died admiral of the Blue in 1806. His son, SIR RICHARD, second baronet, born in 1774, was posted in 1794, commanded the *Sirius*, 36, at the capture of the *Waakzaamheid*, 26, *Furie*, 36, and *Dédaigneuse*, 36, and was captain of the

Achille, 74, at Trafalgar. He was commander-in-chief in the East Indies from 1816 to 1820, and died a vice-admiral and commander-in-chief at the Nore in 1834. His second son, SIR GEORGE ST. VINCENT DUCKWORTH-KING, K.C.B., fourth baronet, born in 1809, was captain of the *Leander* and of the *Rodney* during the Russian War, second in command of the Naval Brigade before Sebastopol, and commander-in-chief in China and the East Indies from 1863 to 1867. He succeeded to the baronetcy in 1887, and died an admiral in 1891.

King-Bird (*Tyrannus carolinensis*), a North American insectivorous bird that preys upon bees. The plumage is slaty-ash above, white below, and there is an erectile orange crest. The name is applied with a distinctive epithet to some other species of the genus.

King-Crabs, an order of branchiate Arachnida (q.v.), known as the Xiphosura. They are of great interest, as they are the nearest living representatives of the extinct orders the Trilobita (q.v.) and Eurypterida (q.v.), and their geological affinities have been in the main determined by work upon this group. The body of the Common King-Crab (*Limulus polyphemus*) consists of three main regions. A large rounded shield protects the anterior end of the body (cephalothorax). This is continued back into two sharp angles, between which is a smaller area formed of the rest of the thorax and the abdomen (more correctly, the mesosoma and metasoma) fused together; this region protects the folded plate like gills or branchiæ. The third region consists of a long, straight spine or telson. The appendages around the mouth are very characteristic of this order, as there are six pairs, which all end in claws, while the basal joint (or coxa) of each is modified to act as a jaw. At one time the King-Crabs were placed with the Crustacea, but their true affinities with the Arachnida are now generally recognised. In their development they pass through a stage much like the Trilobite *Trinucleus*, and there can be no doubt that this order and that of the great Eurypterids (q.v.) of the Silurian and Devonian periods must follow the King-Crabs into the Arachnida. The living forms are marine, and inhabit the Indian and Pacific Oceans and the Caribbean seas.

King-Cups. [MARSH MARIGOLD.]

Kingfisher, any species of the family Alcedinidæ, with nineteen genera, containing about 125 species, universally distributed. There are two sub-families. In the typical one the bill is long and powerful, with a ridge on the upper mandible. The legs are weak, but the toes, united for part of their length, are well adapted for perching, and the flight is strong and rapid. The Common Kingfisher (*Alcedo ispida*) is a fairly common British bird, chiefly frequenting the south of England. The total length is about 7 inches, and the plumage chiefly blue and green, with brilliant metallic gloss. It usually dives for its prey from a bough overhanging a stream; and the fish taken not only serves for food—from the disgorged bones is built the nest, which is situated at the end of a hole in the bank. This bird is the halcyon of classic myth, the

widowed Alcyone who shared the transformation of her husband Ceyx (Ovid, *Met.* xi.). The Daceloninæ, the second sub-family, have a stouter and flatter bill, and feed on insects, frogs, mice, etc. The type-genus *Dacelo* inhabits Australia and New Guinea. The best-known species is *D. gigas* ("the Laughing Jackass"), about the size of a crow, with chestnut plumage, barred with light blue on the wings. Its note is a wild, unearthly laugh.

Kinglake, ALEXANDER WILLIAM (1809–91), historian, was born at Taunton, and educated at Eton and Trinity College, Cambridge. He was called to the bar in 1837, and represented Bridge-water as a Liberal from 1857 to 1868. In 1844 he published a graphic and picturesque volume of travels entitled *Éothen*. His *History of the War in the Crimea* (eight volumes, 1863–87), one of the most brilliant historical works in the English language, was based on the most careful inquiry into details as well as on his personal observations; but many critics regard it as coloured by an over-great admiration of his friend, Lord Raglan.

Kinglet. [GOLDEN-CRESTED WREN.]

Kings, BOOKS OF, two historical books of the Old Testament, coming after the Books of Samuel, the four being called the Books of the Kingdom. They were probably compiled by several persons, who wrote successively on their own times, and were edited, with additions, by a writer of the 6th century B.C. They deal with the period from the close of David's reign to the death of Nebuchadnezzar during the Captivity.

King's College (LONDON), an educational institution in connection with the Church of England, founded and incorporated in 1828, opened 1831, confirmed in 1882 by Act of Parliament. The subjects taught include theology, literature, science, mechanics, medicine. There are also a female department, evening classes, and a preparatory school for boys. It grants the title of associate.

King's Counsel. [QUEEN'S COUNSEL.]

King's County, a county of Ireland in the province of Leinster, bounded by Co. Westmeath on the N., Roscommon on the N.W., Galway on the W., Tipperary on the S.W., Kildare on the E., and Queen's County on the S.; area, 772 square miles. The surface is level, comprising a large portion of the Bog of Allen, besides numerous other bogs; but on the S. border there is a mountainous district, consisting of the western half of the Slieve Bloom range. The soil, chiefly a gravelly loam, is fairly good. The Shannon skirts the N.W. border. The county was formed in 1557, and named after Philip of Spain.

King's Evil, a popular name applied to scrofula, which was at one time believed to be curable by the touch of the royal hand.

Kingsley, CHARLES (1819–75), novelist, poet, and social reformer, was born at the vicarage of Holme on the edge of Dartmoor. From King's College, London, he proceeded to Magdalene College, Cambridge, and, after graduating with double honours (1842), was ordained, and received

the curacy of Eversley in Hampshire. He was presented to the living in 1844, and remained here throughout the rest of his life. Although, from the circumstances of his birth and education, Kingsley sympathised keenly with the tastes, the pursuits, and even the prejudices of the upper ranks of society—a bias which he retained to the end of his life—he was, nevertheless, an ardent champion of the rights of the working man, whose condition he regarded as a disgrace to a country professing Christianity. As a member of the little group called “Christian Socialists” he advocated the principle of co-operation, and the evils of the “sweating system” were vividly exposed in his first novel, *Alton Locke* (1849). In the same work he displayed his sympathy with the aims and aspirations, if not the methods, of the Chartists, whose cause he had already aided powerfully by his letters in the *Christian Socialist* and *Politics for the People*, signed “Parson Lot.” *Yeast* (1851) showed a keen insight into the condition and the wants of the agricultural labourer. Kingsley also took an active part in promoting sanitary reform, and other measures for improving the material as well as the moral surroundings of the labouring population. He afterwards earned a more brilliant, though not more honourable, reputation by his historical novels *Hypatia* (1853), *Westward Ho!* (1855), and *Hereward the Wake* (1866), dealing respectively with the struggle between the Church and the Neoplatonists at Alexandria in the 5th century, the conflict of England with Spain and of the Protestant with the Roman Catholic religion in the reign of Elizabeth, and the last efforts of the conquered Saxons against William the Norman. Kingsley was Professor of History at Cambridge from 1860 to 1869, when he was appointed a Canon of Chester. As a Churchman he must be classed with the “Broad church” section, but with him religion was a matter of intense personal conviction, and he carried into his own all the earnestness and vigour which were inseparable from his character. His drama, *The Saint’s Tragedy* (1848), never attained wide popularity, but his beautiful lyrics, *The Sands of Dee* and *The Three Fishers*, have earned him a recognised place among the poets of the century. His brother, HENRY KINGSLEY (1830–76), wrote many novels, at once stirring and pathetic, of which *Ravenshoe* (1861) is perhaps the best.

Kingston, WILLIAM HENRY GILES (1814–80), a popular writer of tales of adventure for boys, generally dealing with life at sea and in remote parts of the world. Among the chief favourites must be reckoned *The Three Midshipmen*, *The Three Lieutenants*, *The Three Commanders*, and *The Three Admirals*.

Kingston, a city of Canada in the province of Ontario and co. of Frontenac, on the N.E. coast of Lake Ontario, 160 miles E.N.E. of Toronto. It stands on the site of the old French fort of Frontenac, near the mouth of the Cataraqui, which forms a fine harbour as it enters the lake. The town, which is well fortified, contains many handsome buildings, and carries on a brisk trade. The

industries include shipbuilding and the manufacture of steam-engines and locomotive machinery, leather, boots and shoes, etc.

Kingston, the capital of Jamaica, and an important commercial town, is situated on the S. coast of the island, on a sloping plain which rises from the sea to the Blue Ridge Mountains on the N. A spur of these mountains encloses the city on the E., and afterwards becomes a promontory extending 6 miles westwards, so as to form one of the most magnificent harbours in the world. At its extremity is the town of Port Royal. A railway connecting Kingston with Spanish Town, the old capital, 10 miles to the W., was constructed in 1846. Kingston was almost destroyed by fire in 1882.

Kingston, a city of the U.S.A., capital of Ulster County, New York State, on the Rondout, 54 miles S. of Albany. It exports large quantities of flagstones.

Kingston-upon-Hull. [HULL.]

Kingston - upon - Thames, a municipal borough and market-town of Surrey, on the right bank of the Thames, 5 miles S. of Richmond, and 12 miles S.W. of London by railway. The residents are for the most part London business men. A bridge or ford existed here at a very early date, and many Roman antiquities have been found in the neighbourhood. The King’s Stone, a rude block on which seven of the Saxon kings are said to have been crowned, now stands in an open space in front of the Court House. Kingston received its first charter from King John.

Kingstown, a thriving seaport, 7 miles S.S.E. of Dublin. Prior to 1817 it was an insignificant fishing village. Its harbour, begun in that year from designs by Rennie, was completed in 1859, at a cost of £825,000. It has an area of 250 acres, and is described by the Tidal Harbour Commissioners as “one of the most splendid artificial ports in the kingdom.” The name was changed from Dunleary to Kingstown on the occasion of a visit of George IV. in 1821. It is now a fashionable suburb of Dublin. Mail-packets cross to and from Holyhead twice daily.

Kinkajou (*Cercoleptes caudivolvulus*), an arboreal arctoid carnivore, from Central America. The body, about a foot long, with a tail half as much more, is covered with soft yellowish-brown fur. It is lemur-like in appearance, uses its hands, feet, and prehensile tail quite in monkey fashion, and feeds on fruit and small animals.

Kinkel, JOHANN GOTTFRIED (1815–82), a German poet, born near Bonn, wrote *Otto der Schütz* (1846), and other epics, *Nimrod*, a drama (1857), and numerous other works.

Kino. There are two preparations of this drug in the pharmacopœia—tincture and compound kino powder. Kino is used for its astringent properties, and is a valuable remedy in some forms of diarrhœa.

Kinross-shire, a county of Scotland, bounded by Perthshire on the N. and W., and by Fifeshire on the E. and S.; area, 78 square miles. It consists of a level plain surrounded by hills, ranging from

734 to 1,573 feet in height. On the W. side of Loch Leven, which occupies the centre of the plain, and 27 miles N.N.W. of Edinburgh, stands the capital, Kinross, an ancient town, containing Kinross House (1685), designed by Sir William Bruce, the architect of Holyrood.

Kinsale, a municipal borough, seaport, and important fishing station in Co. Cork, 24 miles S.S.W. of Cork by railway. The town, which is quaint and picturesque, is situated on the slope of Compass Hill, overlooking the winding estuary of the Bandon, which forms a fine natural harbour. The antiquities include a 14th-century church and a ruined castle of the De Courcys, some two centuries older. A part of the town, called the "World's End," is still inhabited by the descendants of the Spaniards who landed here in support of the O'Neill confederacy, and held the town for ten months against Lord Mountjoy and Sir George Carew (1601-2). James II. landed (1689) and embarked (1690) here, and a house in which he lodged was preserved till 1884.

Kintyre, or CANTYRE (Gaelic, "headland"), a peninsula in the S. of Argyleshire, running 42 miles S. by W. between the Firth of Clyde and the Atlantic, with a mean breadth of 7 miles. A low ridge of hills traverses the peninsula from N. to S. In the N. it is connected with Knapdale by the isthmus of Tarbert, and terminates in the S. in the Mull of Kintyre, 13 miles distant from Ireland, with a lighthouse 297 feet above high water.

Kipchaks, a historical Turki nation, Eastern Turkestan, now chiefly between the Kara-daria and Naryn rivers, province of Andijan. Although often classed with the Buruts, their affinities seem to be rather with the Kirghiz. Some even regard them merely as a branch of the Middle Horde, by whom the purity of the Kirghiz type and speech has been best preserved. After the overthrow of the ancient Kipchak kingdom about the Lower Volga, the nation was dispersed in various directions, so that groups of Kipchaks are still found in Bokhara, Khiva, Khokand, and many other places.

Kiranti, a Himalayan people of East Nepal, on the Sikkim frontier, probably of Kolarian stock, their language resembling the Munda Kolarian in its intricate verbal system; two main branches, *Hung* and *Rai*, with collective population of 250,000. (Dalton.)

Kirby, WILLIAM (1759-1850), the entomologist, was born in Suffolk, and educated at Ipswich and Cambridge. He took orders in 1782, and became vicar of Barham, Suffolk, in 1796. Before becoming an entomologist he gave much attention to botany, and was one of the original fellows of the Linnean Society. In 1802 he published a monograph on English bees. Three years later he made the acquaintance of William Spence, and in 1815 appeared the first volume of their joint work on entomology. Kirby, who was elected F.R.S. in 1818, was also author of *The History, Habits, and Instincts of Animals*, and founded the new insect order of Strepsiptera. [SPENCE.]

Kirghiz, a main division of the Tatar race, who occupy a vast domain in South-West Siberia, Turkestan, and East Russia; but their real home are the steppes stretching from the Ural River eastwards to beyond Lake Balkash (50°—85° E. long.). Three great historical branches—*The Little Horde*, between the Ural River and the Kara-Kum desert, north of the Aral Sea; *The Middle Horde*, from the Aral Sea to Lake Balkash; *The Great Horde*, from west end of Lake Balkash eastwards, besides the *Kara* ("Black") Kirghiz of the Turkestan highlands and those of the Volga steppes, with total population (1890) of 3,100,000. Nearly all are Sunnite Mohammedans and nomads, speaking a Turki dialect closely related to that of Kashgar. Type: medium height, square, flat features, prominent cheek-bones, small, oblique eyes, large mouth, hands and feet very small, yellowish-brown or swarthy complexion; morally frank, honest, and trustworthy, hospitable to strangers, and tolerant in religion, allowing their women to go unveiled, and otherwise indifferent observers of the Koranic precepts. According to national usage, the term *Kirghiz*, of doubtful origin, is restricted to the Kara-Kirghiz, all the others calling themselves *Kazak* ("Riders"), which is the same word as the Russian *Cossack*: hence the Russian compound word *Kirghiz-Kazak* applied to the whole nation. Some writers regard the Kirghiz, not as a distinct race, but as a confederation of numerous nomad Mongolo-Tatar tribes stretching from the Gobi Desert to the Volga, and united together for administrative purposes by Jenghiz Khan and his successors.

Kirkcaldy, a seaport town on the Firth of Forth in Fifeshire, Scotland, 15 miles N. of Edinburgh. It was made a burgh of regality, holding of Dunfermline Abbey in 1334, and became a royal burgh in 1450. It is celebrated for its manufacture of linen cloth, and there are also potteries, and the growth of its shipping industry has been recently aided by the construction of a new harbour. St. Brycedale Free Church, built in 1881, is a fine building, and the town has two public libraries. With three other towns Kirkcaldy unites to form a district which returns a member to Parliament.

Kirkcudbright, or EAST GALLOWAY, a county or "Stewartry" in the south of Scotland, having Ayr on the N., Dumfries on the E., and Wigtown on the W. Its area amounts to 574,587 acres, and there is a coast-line of 45 miles. It is mountainous in the N.W., but is elsewhere gently undulating. Many cattle are reared, and granite is quarried. There is good salmon fishing at the mouths of the numerous rivers—the Dee, the Urr, the Nith, etc.—and deep-sea fishing in the Solway Firth. Besides the capital, Kirkcudbrightshire contains the towns of New Galloway, Castle Douglas, Gatehouse, and Maxwelltown. The county sends one member to Parliament. 2. KIRKCUDBRIGHT, the capital, stands at the mouth of the Dee at the head of Kirkcudbright Bay. It is a very old town, and was made a royal burgh in 1455. The old Court House is now used as a Volunteer drill-hall.

Kirkcudbright is a member of the Dumfries district of parliamentary burghs. It has the best harbour in the south of Scotland, but is otherwise without commercial importance. At the mouth of the bay, on Little Ross Island, is a good lighthouse.

Kirke, PERCY (d. 1691), the notorious commander of "Kirke's Lambs," was the son of a courtier of Charles I. and Charles II. In 1666 he was given a commission in the army, and became colonel in 1680. He then went out to Tangier in command of eight companies raised by him in the neighbourhood of London. He became governor of the newly-acquired possession in 1682. On its evacuation two years later he returned to England with his "Lambs" (so called from the Paschal Lamb which was the badge of the regiment). At Sedgemoor he was present as brigadier-general, and after the battle gained his infamous name by his severities, which, however, were much exaggerated. William III. made him a major-general, and in 1690 he reached the rank of lieutenant-general. In 1689 he relieved Derry, and afterwards served at the Boyne and at the siege of Limerick.

Kirkstall Abbey, a Cistercian house (12th century), 3 miles to the N.W. of Leeds, by whose Corporation the ruins were purchased in 1888. The site of the abbey was originally at Barnoldswick. It is long and narrow, in the Perpendicular and Transition Norman styles, and is in a good state of preservation.

Kirkwall. [ORKNEY.]

Kirschwasser, the name of a liqueur made in Germany and Switzerland from ripe wild cherries, which are stoned and crushed in a wooden vessel. When fermentation has set in, the kernels are added and the liquor is then distilled.

Kisfaludy, SANDOR (1772-1844), a Hungarian poet, served for many years in the Austrian army, but afterwards devoted himself to literature and farming. His chief work was called *Himfy's Loves* (1801-7). His collected works appeared in 1847, and to these in 1870 were added four volumes of posthumous writings. His brother, KAROLY (1788-1830), who was born at Tet in Raab and died at Pesth, was a prolific dramatist. His chief works were *The Student Matthias* and *The Tatars in Hungary*. In 1837 a society was formed to commemorate the literary services of the brothers.

Kish. When cast-iron is melted and allowed to solidify, a quantity of graphite—known technically as *kish*—separates out. It is thus also found as deposits in the blast-furnaces where iron is smelted.

Kishineff (KISHINEV), the chief town of Bessarabia, a Russian province bordering on Roumania, stands on a tributary of the Dniester. It was ceded to Russia in 1812, and has since then rapidly increased in population. It has some commercial importance, and is an archiepiscopal see. Tobacco, the vine, and various kinds of fruit are grown in the neighbourhood.

Kissingen, a watering-place in Bavaria, situated on the right bank of the Saale, about

18 miles north of Würzburg. It has three mineral springs, besides the spas of Bocklet and Brückenau in the neighbourhood. They have been used for nearly four centuries, but it was not until comparatively recent times that they were much frequented. Gout, dyspepsia, and skin diseases are cured by them, the waters being taken by patients both externally and internally.

Kistvaen. [BARROW.]

Kit-Cat Club, an English club formed about 1700 by thirty-nine noblemen and gentlemen who were favourable to the House of Hanover, said to get its name from one Christopher Katt or Catt, a pastrycook, at whose house it met. The founder was Jacob Tonson, the eminent publisher, and the members included Walpole, Congreve, Addison, and Garth. On the dissolution of the club (1720) every member presented Tonson with his portrait.

Kitchen-Midden, a translation of the Danish *Kjökken-mödding*, the name originally given to the pre-historic refuse-heaps containing shells, bones, and implements, and at one time supposed to be raised beaches. Similar heaps occur in Great Britain, France, America, and Australia.

Kite, a popular name for any one of a loosely defined group of birds of the family Falconidæ (q.v.), with weak, untoothed bill, long, pointed wings, and the tail generally long and, in most cases, forked. They are widely distributed, and feed on small vertebrates and offal, and one South American form subsists chiefly on fresh-water molluscs. The type-genus *Milvus*, with six species, ranges over the Old World and Australia. The Common Kite (*M. ictinus*) is about 2 feet long, with brown plumage on the upper surface, where the feathers are edged with red, and rufous below. It is rare in Britain, but in the 16th century was common in the streets of London, and was as useful a scavenger as is *M. govinda*, the Pariah Kite, in Indian cities at the present day. *M. isurus*, the Australian form, is crested.

Kits Cotty House, a fine megalithic structure on the slope of the North Downs near Aylesford, Kent. This dolmen consists of three upright stones, with a cap-stone measuring 11 feet by 8 feet. There is no satisfactory explanation of its name, but it is said traditionally to mark the burial-place of Catigern, who was slain in A.D. 455. All such structures are, however, probably far older. The stones are "sarsens" or "grey-wethers" from the Thanet sands which cap the neighbouring escarpment, and there are other similar but less perfect remains at Addington and elsewhere in the neighbourhood.

Kitto, JOHN (1804-54), author of *The Pictorial Bible* and many other works, was born at Plymouth, his father being a stonemason. After a few years at school he began to help him, but in 1817 fell from a ladder and became deaf for life. Two years later he was sent to the workhouse, where he remained for several years, till in 1824 he went to live in Exeter. While there he became interested in religious matters, and in 1827 was sent as a

printer to Malta by the Church Missionary Society. Two years later he went to Persia, and was at Bagdad till 1832. On his return he began his literary career. He published in 1838 *The Pictorial Bible*, and in 1845 *The Lost Senses*. In 1850 he received a Civil List pension.

Kittool Palm (*Caryota urens*), a beautiful tree, 50 to 60 feet high, native to India and Ceylon, with bi- or tri-pinnately divided leaves, 20 feet long and 10 or 12 feet across, with cuneate segments and a sheathing fibrous base. *Toddy* or palm-wine and *jaggery*, or palm-sugar, are prepared from its flower-spikes; sago from the interior of its stem; and *kittool* or *Indian gut*, used for brushes and fishing-lines, from its fibrous leaf-stalks and ramenta.

Kiungtha, *i.e.* "Children of the Rivers," the collective name of the lowlanders of Arakan, called Mugs by the Bengalese; are of Burman stock, and often call themselves Miam-ma, *i.e.* Burmese.

Kizil-Bash, *i.e.* "Red Heads," a term applied to certain Turkoman tribes in Asia Minor and Persia, who form a sect or brotherhood like that of the Beyyadiyahs of Oman; are a fine race, very fair, speaking both Persian and Turki. The name appears to have been originally given by Shah Ismail to the Nikalu, and six other valiant Turki tribes, to whom he owed his successes. Some were settled by Nadir Shah in Cabul, where they are still known as Gholam-i-Shah, the "king's servants."

Kjerulf, HÅLFEDAN (1815-68), Norwegian composer, was born at Christiania, where his father was a government official. He studied law at the university, but on the death of the elder Kjerulf turned to music. He obtained a government grant to enable him to study at Leipzig under Richter, and between 1860 and 1865 set many ballads and lyrics, among which were some of Björnson's and Moore's. His songs were translated by Marzials.

Klagenfurt, the chief town of Carinthia, Austria, dates from the 16th century. Since 1809, when it was taken by the French, it has ceased to be a fortress; but it has an active transit trade and manufactories of white lead, cast-iron, and leather. The chief glories of the place are the palace of the Prince-bishop of Gurk, the Rudolfinum museum, and a large library.

Klamath. [KAROK.]

Klapka, GEORGE, one of the chief leaders in the Hungarian revolution, was born in 1820. He served in the Austrian army till 1848, when he joined his countrymen and rendered distinguished services to Hungary, for whom he held the fortress of Komorn to the last. He availed himself of an amnesty to return to Hungary in 1867. He is the author of *The National War in Hungary and Transylvania* (1851), and some *Memoirs* (1st ser. 1850; 2nd ser. 1886).

Klaproth, HEINRICH JULIUS VON (1783-1835), traveller and writer on Oriental subjects, was the son of a professor of chemistry at Berlin. Having been sent as interpreter on a Russian embassy to

China, he explored Siberia. After travelling in the Caucasus he returned to Germany in 1812, but spent the rest of his life in Paris, where he was appointed in 1816 professor of Asiatic languages. He published many works in French and German on Oriental philology, Egyptology, etc., and was an accomplished Chinese scholar.

Klausenburg, or KOLOZSVAR, a town in Transylvania, Hungary, about 200 miles S.E. of Buda-Pesth, has a university, a Unitarian college, and other educational institutions. It also contains the national museum. The making of machines and oil are the chief industries.

Kléber, JEAN BAPTISTE (1753-1800), one of the most brilliant generals of the first French Republic, was the son of a Strasburg mason. He first distinguished himself at the siege of Mayence; after which he went to La Vendée, as general of brigade. Although he won the important victories of Mans and Savenay, he was recalled because he dared to be merciful to the conquered. He was soon, however, again employed, and served with distinction under Jourdan in Belgium. He shortly afterwards resigned his command. Having escaped transportation after the 18th Fructidor he went with Bonaparte to Egypt, and was wounded at Alexandria. On the return of the latter to France, Kléber was left in command. Thinking the French cause in Egypt hopeless he concluded the Convention of El Arish, but when this was disavowed by the English government he again took the offensive and defeated the Turks at Heliopolis. Not long after he was assassinated by a fanatic.

Kleene-Bok (*Antelope perpusilla* = *Cephalophus pygmaea*), a very small antelope from South Africa.

Kleist, HEINRICH WILHELM VON (1777-1811), a German dramatist, was born at Frankfort on the Oder. Having left the Prussian army, studied law at Berlin, and travelled, he was advised by Wieland, in 1802, to enter upon a literary career. He still, however, continued his wanderings, and in 1806 was taken prisoner while serving against the French. The next year saw his drama *Amphitryon* published at Dresden; but in the autumn of 1808 he tried to commit suicide. During the French war of 1809 against Austria he wrote some patriotic songs, and in the same year his *Prinz Heinrich von Hamburg* was given at Berlin. Having failed as a journalist, and being unable to obtain a Government post, Kleist put an end to his life in 1811. His best play was *Küchen von Heilbronn*. He also wrote several stories. He is not to be confounded with Ewald Christian von Kleist, author of *Frühling*.

Kling, a term applied in the Eastern Archipelago to the traders and the settlers of Indian origin; it is a corruption of *Kalinga*, the old Sanskrit designation of the East Coast, whence most of them migrated to Malaysia.

Klopstock, FRIEDRICH GOTTLIEB (1724-1803), one of the fathers of German literature, was born in Saxony. Having read with deep interest *Paradise Lost*, he devoted his life to the composition of

a German religious epic, which was to be its complement. *The Messiah* was begun while he was a theological student at Leipzig, the first three cantos being published in 1748 in the *Bremische Beiträge*. He was enabled to continue it at his leisure when, in 1751, he was given a pension by Frederick of Denmark. During his twenty years' residence at Copenhagen he finished the great work, which was received with enthusiasm throughout Germany. Chief among his other works were a trilogy on Hermann, the national hero of Germany, and some odes.

Knapweed, or knobweed (*Centaurea nigra*), a common British composite plant, with globose involucre of many imbricate, blackish-brown, membranous, and fringed scales, forming a hard knoblike head, and a thistle-like inflorescence of crimson tubular florets.

Knaresborough, a town in the West Riding of Yorkshire, 17 miles N.W. of York. There are ruins of a 12th-century castle; and among other objects of interest an old church, a dropping well, and St. Robert's Cave, well known for its connection with the crime of Eugene Aram. The grammar school was founded in 1616. The manufacture of linen and woollen rugs is the chief industry.

Knee. Three bones enter into the formation of the knee-joint—the femur, the tibia, and the patella or knee-cap. This last-named bone is an example of what is known as a *sesamoid* bone, being an ossified portion of the tendon of the great extensor-muscle, which lies in front of the thigh. The connection of the lower part of the patella with the tibia is called the *ligamentum patellæ*. This ligament is really the extremity of the tendon of the afore-mentioned muscle; the patella being interposed between the ligament and the muscle proper. The knee-joint is one of the largest and most important in the body. It possesses a capsular ligament and numerous other ligaments, the most important of which are what are known as the *crucial ligaments*, two strong bands connecting the femur and tibia, and disposed crosswise. For the diseases to which it is subject see JOINTS, DISEASES OF. The patella, from its exposed situation, is liable to injury; fracture of the patella not infrequently occurs, however, apart from external violence, as the result of muscular action, in cases where a person who is about to fall makes a violent attempt to recover his equilibrium.

Knee-jerk, a sudden jerking of the knee, caused by the contraction of the quadriceps muscle.

Kneller, SIR GODFREY (1646–1723), a painter of German extraction, was a native of Lübeck. He was sent to Leyden with a view to a military career, but afterwards removed to Amsterdam, where he studied painting under Ferdinand Bot, and perhaps had lessons from Rembrandt. After a short residence at Lübeck he went to Italy, where he especially studied the works of Titian and Tintoretto. He now began to paint portraits, and

after a short stay in Germany, came to England in 1675 with a letter of introduction to Jonathan Banks, a rich merchant. Through him he was introduced to the Duke of Monmouth, whose portrait he painted, and in 1678 was given a sitting by Charles II., whose portrait was being painted by Lely at the same time. His fortune was now made. He painted James II. and Louis XIV., but was, notwithstanding, knighted by William III. Among other sovereigns whose portraits were done by him were Queen Anne, Peter the Great, the Duke of Bavaria, and the Archduke Charles (afterwards Charles V.). George I. also sat to him, and created him a baronet. Other examples of his work are the *Beauties*, at Hampton Court, the *Admirals*, and the portraits of the Kit-Cat Club.

Knight, CHARLES (1791–1873), an author and publisher, was the son of a Windsor bookseller. He early wrote verses and started a newspaper, but his ambition was to be a popular educator. His first effort in this direction was made in 1820, when he began to edit *The Plain Englishman*. Three years later he set up as a publisher in London, and obtained the assistance of Macaulay, Praed, and other rising men of letters for his magazine. The *Penny Cyclopædia*, *The Gallery of Portraits*, Lane's *Arabian Nights*, the *Pictorial History of England*, and other useful works were published by him. He himself wrote a great part of *London* (1841–44). In 1841 appeared Knight's *Pictorial Shakspeare*. In his *Store of Knowledge for all Readers*, which came out weekly, there were contributions by Harriet Martineau, G. H. Lewes, and Mrs. Jameson. *The Popular History of England*, in eight volumes, was finished in 1862.

Knighthood, the highest rank of chivalry (q.v.), originally the status of a fully-armed and equipped horse-soldier of approved training and valour. The rank and title of knight were thoroughly established before the period of the Norman Conquest, but the institution of knight-hood was developed considerably during the period of the Crusades, when the great religious orders of St. John of Jerusalem, the Templars, and the Teutonic Knights were founded, and a religious character impressed to some extent on all knight-hood. The noblest persons came to covet a title originally applied to a superior (military) *servant*. In Germany the knight was a *ritter*, a “rider;” in France, Italy, and Spain, a “horseman,” *chevalier*, *cavalleri*, *caballeri*. With the decline of chivalry knight-hood gradually lost its religious, romantic, and even military characteristics, and degenerated into a lower grade of nobility, though the great national orders maintained their pre-eminence in distinction, some even to the present day. [BATH, GARTER, GOLDEN FLEECE, ST. GEORGE, ST. PATRICK, THISTLE, STAR OF INDIA, ETC.] In Great Britain the knight-hood of modern times is a titular reward of distinction, official merit, or political service.

Knights of Labour, a labour organisation founded in Philadelphia in 1869 with the object of

advancing the interests of every kind of labour, skilled and unskilled—in short, of wage-earners generally. Its first large assembly was held in 1878, and it kept increasing until in 1886 its numbers reached 750,000. Since then it has steadily decreased, and now there are only about 100,000 members.

Knot, the nautical name for the geographical mile. It was originally a division of the log-line, answering to half a minute as a mile does to an hour; *i.e.* it was the $\frac{1}{120}$ th part of a mile. Hence, when a ship was said to be sailing eight knots, it was meant that she was sailing eight miles an hour. The "Admiralty Knot" now means 10 cables, or 6,080 feet (1.1515 statute miles). The following table converts admiralty knots into statute miles of 5,280 feet:—

Knots.	Miles.	Knots.	Miles.	Knots.	Miles.
6.00	6.990	12.00	13.818	18.50	21.303
6.50	7.484	12.50	14.393	19.00	21.878
7.00	8.060	13.00	14.966	19.50	22.454
7.50	8.636	13.50	15.545	20.00	23.030
8.00	9.212	14.00	16.121	20.50	23.606
8.50	9.787	14.50	16.696	21.00	24.181
9.00	10.393	15.00	17.272	21.50	24.757
9.50	10.939	15.50	17.848	22.00	25.333
10.00	11.515	16.00	18.424	22.50	25.909
10.50	12.090	16.50	18.999	23.00	26.484
11.00	12.666	17.00	19.575	23.50	27.060
11.50	13.242	17.50	20.151	24.00	27.636
		18.00	20.727		

Knot (*Tringa canutus*), a northern wading bird of the Snipe family, visiting Britain in the autumn. It is about 10 inches long, with mottled brownish-black plumage above, below brownish-red in summer and white in winter. It is prized as a delicacy, and is said, but without evidence, to be named after King Canute.

Knout, an instrument of torture formerly used in the Russian army, introduced by Ivan III. (1462–1505). It consisted of a whip with a handle 6 inches long and a lash made of leather, fitted with iron rings, of more than 40 inches. Victims frequently died under its application. A knout of milder form is occasionally used now for criminals.

Knowles, SIR CHARLES, BART., English admiral, born in 1702, was with Vernon in the West Indies, and was entrusted with the demolition of the forts at Porto Bello. He assisted at the operations in the river Chagres and at the siege of Cartagena, and in 1743 he commanded the unsuccessful expeditions against La Guaira and Porto Cavallo. He was afterwards governor of Louisbourg, and, upon his promotion in 1747 to flag-rank, was governor of, and commander-in-chief at, Jamaica, upon which station he captured Port Louis, in Hispaniola, and defeated a Spanish squadron off Havana. For some neglect of duty in this action he was court-martialled and reprimanded. In 1757 he was second-in-command of the unfortunate expedition against Rochefort. He became a full admiral in 1758, was created a baronet in 1765, and died in 1777. His son, SIR CHARLES HENRY KNOWLES, BART., also a naval officer, signalled himself during the American War, and, after much hard service,

became a captain in 1780. He had previously distinguished himself by the invention of a valuable code of signals, which remained for many years in use in the navy. In the *Goliath* he was present at the battle of Cape St. Vincent. In 1799 he attained flag-rank, and he died an admiral and G.C.B. in 1831. He wrote much on naval subjects.

Knowles, JAMES SHERIDAN (1784–1862), the dramatist, was born at Cork. His family came to London in 1793, and the boy when twelve years old wrote a ballad, which became popular. Owing to dislike of his stepmother, he enlisted in the militia, and afterwards went to Aberdeen, where he obtained the degree of M.D. and became resident vaccinator. He next took to acting, and at Waterford in 1810 met Edmund Kean. In the same year he wrote a play for the latter, and followed it up by others, but was obliged to make a living by teaching, first at Belfast and afterwards at Glasgow, where he had a school for twelve years. In 1825 Hazlitt described Knowles as the first tragic writer of his time. The writer was, notwithstanding, compelled to supplement his income by acting in his own plays and by lecturing. *The Hunchback* having been accepted by Macready, but not produced for some time, Knowles got back the MS., and the play was given to Charles Kemble at Covent Garden. It came out on April 5, 1832, with Miss Kemble as Julia and Master Walter by the author. *The Love Chase* was produced in 1837. In 1834 Knowles had a successful American tour, and in 1848 was granted a Civil List pension.

Know-Nothings, a name, derived from their affectation of mystery, given to the *Americans*, the members of the Native American Party, an association based on hostility to foreign immigrants and to Roman Catholics, which in 1844 gained some political success in New York and Philadelphia, but after some riotous attacks on Roman Catholics in the latter city soon sank into oblivion. The name was also applied to the party which, in 1889, wrested the municipal government of Boston from Irish control.

Knox, JOHN (1505–72), the great Scotch reformer, was born at Haddington, and educated there and at Glasgow. He took orders as a secular priest about 1530, and it was not till sixteen years later that he became a Protestant. In 1547, when the French took St. Andrews, he was carried off to France as a prisoner, and had to work in the galleys for nearly two years. Early in 1549 he came to England, and remained there throughout the reign of Edward IV. He was at first minister of Berwick but was afterwards appointed one of the king's chaplains. He was also consulted with reference to the Forty-Five Articles of Religion. When Mary came to the throne he had to leave the country, and he remained on the Continent, chiefly at Geneva, till 1559. On his return to Scotland he joined the Lords of the Congregation, and took the chief part in the Scottish Reformation, drawing up the Confession of Faith in 1560. He did not alter his conduct when Mary Stewart became queen, and

after holding several conferences with her, in which he held very plain language towards her, he was in 1562 tried for treason. He was acquitted, but again came into collision with the Court in consequence of some sermons he preached after the Darnley marriage in 1565. He was then inhibited from preaching, but, notwithstanding, preached the sermon when the young James was crowned. On the death of Murray in 1569 he left Edinburgh, where he had officiated for many years, and retired to St. Andrews. In 1572, however, he preached at Edinburgh again, notably on the occasion of the news of the massacre of St. Bartholomew. In the same year he died. He was a great political force in Scotland, but his *Blast of the Trumpet against the Monstrous Regiment of Women*, though directed against her rival, gave mortal offence to Queen Elizabeth, and probably increased her distaste for affording any substantial support to the Scotch Reformation. Knox's *Historie of the Reformation of Religion within the Realm of Scotland* is a very important historical work.

Knur and Spell, an elaborate development of bat, trap, and ball, played on the Yorkshire moors, the trap (*spell*) being carefully made of metal, and the ball being driven by a slender club, the *knur*. The ball is often sent more than 100 yards.

Koala (*Phascolarctos cinereus*), the Native Bear, an arboreal marsupial from Eastern Australia. It is about 2 feet long, with thick ashy-gray fur. The two inner digits on the fore limbs oppose the other three, and the great toe is thumb-like in functions.

Kobold, an earth spirit, a gnome (q.v.).

Koch, a widespread people of North-East India and Assam, now mostly Hinduised, speaking Bengali and Assamese. Two main divisions, *Bania* (*Pani*) and *Tintikya*, with a great many sub-groups, and collective population of 1,590,000, of whom about 10,000 in the Garo Hills still preserve their primitive speech and customs intact. By Dalton they are regarded as a branch of the great Bhuiya family, whom he classes as Dravidians, while others connect them with the aboriginal Negrito element. They often present a decidedly Negroid type, with thick lips, curly beard, marked prognathism, and almost black complexion.

Koch, ROBERT (b. 1843), a distinguished German physician, was born in the Hartz district. Having taken his M.D. degree in 1866 at Göttingen, he was from 1872 to 1879 attached to a medical department at Woolstein. He had already made important discoveries in connection with consumption and cattle disease, when in 1883 he was sent to India by the German Government to inquire into the causes of cholera. The result was the discovery of the bacterium in 1884. In 1885 he became professor of hygiene at Berlin, and in 1892 rendered important services in connection with the cholera epidemic at Hamburg.

Kock, CHARLES PAUL DE (1794-1871), a voluminous and once popular French novelist, was born at Passy, his father being a Dutch banker. He

began to write at seventeen, and in all produced works which fill nearly sixty volumes. Among the best known of them are *André le Savoyard*, *Georgette*, *Le Barbier de Paris*, and *Mœurs Parisiennes*. They are of the coarse realistic type, but show both observation and invention.

Koh-i-noor, "MOUNTAIN OF LIGHT," the largest diamond belonging to the British Crown. Indian tradition states it to have been found near Golconda more than 5,000 years ago. Tavernier saw it apparently in the possession of the Great Mogul in 1665, when it weighed 280 carats, but was said to have been unskillfully reduced from a former weight of 793 carats. In 1739 it came into the possession of Nadir Shah, and in 1813 into that of Ranjeet Sing. On the annexation of the Punjab in 1849 it became British, but only weighed 186 carats. It has since been recut as a rose-diamond, and so reduced to 106 carats. It is suggested that the Russian Orloff diamond, the largest now known, which weighs 194 carats, and a stone weighing 132 carats, long used by a peasant as a strike-a-light and still belonging to Persia, both originally formed parts of the Koh-i-noor.

Kohl, JOHANN GEORG (1808-78), a German writer and traveller, was born at Bremen, and educated at Göttingen, Heidelberg, and Munich. He travelled in every part of Europe between 1842 and 1851, and wrote works descriptive of his experiences, and afterwards visited Canada and the United States, which he also described. On his return he left Dresden for Bremen, in which latter he was city librarian till his death. His *History of the Discovery of America* was translated into English in 1862.

Kohl-Rabi, or TURNIP-CABBAGE (*Brassica oleracea caulorapa*), is a biennial race of cabbages with the upper part of the stem swollen like a turnip, but produced above ground, green and bearing leaves with wide bases to their stalks. It is very hardy, standing either drought or frost. It is better adapted for strong soils and for dry, hot climates than is the turnip. Cattle and sheep are fond of it.

Koibal. [SOYOTES.]

Kola Nut, the seed of *Cola acuminata*, a sterculiaceous tree, 40 feet high, native to west tropical Africa. In the Western Soudan, where it is known as the *Guru nut*, it is highly valued, being used to clear and sweeten muddy water, to assist digestion, and to allay hunger. About 1865 it was brought into notice as a source of caffeine, of which it contains over 2 per cent., or more than the best coffee, together with glucose and more theobromine and three times as much starch as cacao-beans, which belong to the same natural order. A somewhat bitter chocolate has been prepared from these nuts. About 1,000 baskets of 3 cwts. each are annually imported into Senegambia from Sierra Leone for transmission to France and Germany. The Bitter or Male Kola (*Garcinia Kola*) contains no caffeine.

Kolapur, the name of a tributary state in the presidency of Bombay, having an area of 2,816 square miles; also of its chief town, a place of some size and commercial activity.

Kolarian, a conventional name first applied by Campbell (1866) to numerous hill tribes of Central India, regarded as the true aborigines of the peninsula, distinct in type and speech both from the Dravidians and Aryans; seem to have entered from the north-east, and are probably of Tibeto-Burman stock, intermingled with a still more primitive Negrito element. Many now speak Dravidian and Aryan dialects, but ten distinct Kolarian languages still survive—*Sonthal*, *Munda*, *Kharia*, *Mal-Paharia*, *Juang*, *Gadaba*, *Korwa*, *Kur* (*Kurku*), *Mehto*, and *Savara*. These constitute the so-called Kolarian linguistic family, which was formerly widespread over the plains of Bengal, but is now restricted to the hilly and jungly tracts between Upper and Lower Bengal, to Chota Nagpore, and generally from south of the Ganges to about 18° N. lat. (*Report of the Ethnological Committee of the Central Provinces*, 1868; Caldwell, *Dravidian Grammar*.)

Kolin, a town in Bohemia, situated on the Elbe some 40 miles S.E. of Prague. It is celebrated in history as the scene of one of the great battles of the Seven Years' War, Frederick the Great being defeated here by the Austrians under Daun. The inhabitants are chiefly engaged in the manufacture of sugar and chemicals.

Köl liker, ALBRECHT VON (b. 1817), a Swiss man of science, was born at Zürich, where, after studying in Germany, he became professor of physiology in 1845. Two years later he went to Würzburg as professor of anatomy. He took part with Von Siebold in founding the *Zeitschrift für wissenschaftliche Zoologie*. He has especially devoted himself to the study of embryology, and has written works on *The Development of Man and the Higher Animals*, the *Challenger* report on Pennatulida, and *Handbuch der Genebelehre des Menschen*, translated for the Sydenham Society as *Handbook of Human Histology*.

Kolomea, or KOLOMYIA, a town in Galicia, Austria, 112 miles S.E. of Lemberg, stands on the Upper Pruth. It has large potteries and petroleum and paraffin candle works. A considerable proportion of the inhabitants are Jews.

Kolomna, a town in the government of Moscow, Russia, stands on the Moskowa about 65 miles S.E. of Moscow. The silk and woollen manufacture is the chief industry, but soap, leather, and machines are also made. It was the scene of a Mongol victory over the Russians in 1237.

Komorn (KOMAROM), a town in Hungary, situated at the junction of the Danube and Raab, 48 miles N.W. of Buda-Pesth, on an island called Gross Schütz, connected with the mainland by a bridge of boats. Since the 13th century it has been one of the strongest fortresses in Europe, and was besieged unsuccessfully by the Turks twice in the 16th and once in the 17th century. The fortifica-

tions were improved early in the 19th, and it held out against the Austrians for eleven months in 1848-49. The town is poor, and its trade unimportant.

Kong, a district of Western Africa lying between Liberia, Ashanti, and the Ivory coast, since 1889 under French protection. The Kong Mountains rise a few hundred feet above an elevated plateau of from 2,000 to 6,000 feet. The town of Kong is 500 miles south of Timbuctoo. Its inhabitants are engaged in the manufacture of cotton stuffs and in indigo dyeing.

König, FRIEDRICH (1774-1833), inventor of the steam-press, was a native of Eisleben, Saxony. Being unable to obtain money in Germany to carry out the scheme he had conceived, he came to England in 1806, and with the help of Thomas Bensley, a London printer, a patent was obtained in 1810, the new invention being first used in printing the *Annual Register* of 1811. Improvements were introduced in the followers, and in 1814 the *Times* was first printed by steam-power. In 1816 König also invented a single-cylinder registering machine. A little later he left England and settled at Oberzell, near Würzburg, where with Bauer he set up a manufactory of steam-presses.

Königsberg, a fortified town in East Prussia, near the mouth of the Pregel, was formerly the residence of the Electors of Brandenburg, and still ranks as the third town of Prussia. Still further back it was the headquarters of the Teutonic Knights. The cathedral, dating from the 14th century, contains the tombs both of the Grand Masters of the Order and of the Dukes of Prussia. It was restored in 1856. Little or nothing of the original 13th-century castle remains, the present building dating in its oldest parts from the 16th century only. The Exchange was built in 1875. The Albertine University, so called from its founder the Margrave Albert, has a large library and a famous observatory. It was rebuilt in the present century. Königsberg has large iron-works, and makes machines of all kinds, and pianos. Its chief import is tea, and its largest export corn. At Pillau, 28 miles to the W., the larger merchant vessels unload. In 1365 it became a member of the Hanseatic League, but it was not till 1626 that it was first fortified. It was occupied by the Russians during the Seven Years' War, and was in the hands of the French after Jena. In 1843 it was made a fortress of the first class. The citadel of Friedrichsburg, erected in 1657, is now used as a store.

Königsmark, PHILIP CHRISTOPH GRAF VON, a Swede in the Hanoverian service, who was born about 1660, was accused of intriguing with Sophia Dorothea, wife of the Elector, afterwards George I. of England, and was probably murdered by his orders in 1694.

Konkan, the name given to a coast district in the presidency of Bombay, India, extending from Thana on the N. to the boundary of Goa on the S. The Western Ghats form its eastern boundary. It is well watered. The Marathi dialect is spoken in this district.

Koodoo (*Strepsiceros kudu*), a large African antelope, widely distributed, but becoming rare in the South. The male stands about 13 hands high, and is greyish brown in colour, with white stripes on the sides. The horns are large and spirally twisted. The Lesser Koodoo (*S. imberbis*), from Somaliland and Eastern Africa, is smaller, but similarly marked.

Koran, the name given to the book which contains Mohammed's revelations, used originally for each distinct one, and now for the volume containing them all. According to the Moslem creed, the Koran is a block of stone, resting by the throne of the Almighty, on which is written all the laws, portions of which are supposed to have been told to Mohammed both at Mecca and Medina, either by Gabriel in human shape or by God Himself. Mohammed dictated verses and chapters to a scribe, who wrote on palm-leaves, skins, blade-bones, and the breasts of men, which were thrown carelessly into a box, so that many were lost. After Mohammed's death they were collected into a volume by Zaid Ibn Thâbit, his secretary. In the thirtieth year of the Hegira, Calif Othman had new copies made, placing the 114 suras ("chapters") in descending order as to length. The principal tenets are that there is one God, one true religion, one Day of Judgment. There are said to be more than 20,000 different commentaries on it.

Koranas. [HOTTENTOTS.]

Kordofan, a province of the Egyptian Sudan, lying between Sennaar and Darfur, was conquered by the Mahdi in 1883. After being held successively by Sennaar and Darfur, it was annexed to Egypt by Mehemet Ali in 1821. It is called the White Land, perhaps because the White Nile forms its eastern boundary. Most of the population are slaves, the rest being slave-hunters. Their chief food is millet. Water is found a little below the surface of the soil. The breeding of camels and cattle is carried on, while gums, ivory, ostrich feathers, and gold are exported. The chief town is El-Obeid.

Koreish, a historical Arab people of the Nejd plateau, which has acquired immense celebrity from the fact that Mohammed was a member of this tribe. The Koreish dialect used by him for the Koran has become the classical language of Arabian literature, and the sacred language of Islam.

Koriahs, aborigines of North-East Siberia between Anadyr Bay and Omolon river, N. of Kamchatka; low stature, thin frames, black lank hair, flat nose, small eyes, round face; fishers, hunters, and in religion Shamanists; language closely related to that of the neighbouring Chakchis, to whom they appear to be akin; are dying out, numbering at present (1893) scarcely more than 6,000.

Körner, KARL THEODOR (1791-1813), a soldier-poet of Germany, was born at Dresden, his father being the friend of Goethe and Schiller. At the Freiberg School of Mines he composed some lyrics, which were published in 1810. After studying for

a short time at Leipzig and Berlin, he, in 1811, went to Vienna. During the next two years he produced some tragedies (*Rosamunde* and *Zring*) and other plays (*The Watchman*, etc.) and lyrics. Körner joined the students' corps of Black Hussars in the War of Liberation, when he was mortally wounded in a skirmish between Gadebusch and Schwerin. The best of his patriotic songs are contained in *Leyer und Schwert*, an English version of which appeared in 1839. Many lives of Körner have been published, one of which is by his son Jonas (1881). At Dresden there is a Körner Museum.

Kosciuszko, TADEUSZ (1746-1817), the great Polish leader, was born in Lithuania. He was educated in France at the expense of the State, and on his return to Poland entered the army. In 1777 he went to America, and served throughout the War of Independence. In 1786 he returned to Poland, and three years later was made major-general. The first services rendered by the great patriot to his country were in the war with Russia in 1791-92, when he distinguished himself at Dubienka, having heavy odds against him. After the peace he resigned his commission, but in 1794 was recalled and requested to act as commander against the Russians. He defeated them near Cracow, and a rising followed by which the enemy were driven out of Poland. Now, however, Prussia interposed, and Kosciuszko was defeated at Szezekochin. He defended Warsaw successfully for a time, but in an attack on a superior Russian force which came to its relief he was overpowered by numbers, wounded, and made prisoner. After two years' captivity he went to England, and thence to America, but in 1798 finally settled in France. He refused to assist Napoleon in his designs on Poland, and disowned the appeal issued in his name. In 1814 he had an interview with Alexander I. in France, but nothing came of it, and next year Kosciuszko retired to Switzerland, where he died from the results of a horse accident. He was a greater soldier than statesman. The most accessible life is in Michelet's *Pologne et Russie. Légende de Kosciuszko*.

Kossovo, a strip of level country on the south-eastern frontier of Servia, about which there is a body of literature celebrating the two battles fought on it. The first took place on June 15, 1389, and was fatal to Servian independence, though Sultan Murad I. fell in the fight. The second was the victory in October, 1448, which Murad II. won over Hunyadi, the Hungarian leader.

Kossuth, LOUIS, the Hungarian patriot, was born in 1806. In 1832 he began his political career as a proxy in the Pressburg parliament. He soon embroiled himself with the authorities by publishing a manuscript journal in which the debates were reported, and was imprisoned for refusing to discontinue it. In 1841 he began to edit the *Pesth Journal*, and three years later formed a National League, which was really, though not ostensibly, directed against Austria. In 1847 he was elected member for Pesth, and in 1848 moved the establish-

ment of a responsible Hungarian Ministry. This was granted after a deputation had waited upon the emperor, and Kossuth became Finance Minister. All classes were now to pay taxes and to be equal before the civil authority, the franchise was extended, feudal privileges were given up, and the land system reformed. The Austrian Government now, however, took advantage of the Croat insurrection to revoke the grant of constitutional rights, and when the insurgents had been defeated, Kossuth determined to support the Viennese movement which had followed the third French Revolution. The Magyars were defeated, but the Hungarians refused to recognise the new Austrian emperor, Francis Joseph. They were at first successful, but dissensions broke out amongst the leaders, and in October, 1849, Kossuth resigned his dictatorship to his rival Görgey, and took refuge in Turkey. Two years later he came to England, and afterwards went to the United States, giving lectures advocating the Hungarian cause. After his return he passed many years in England, but after 1867 lived a retired life at Turin. Kossuth not only refused to accept the settlement of 1867, but even lost his rights as a Hungarian citizen in 1890, as he had neglected to take the steps necessary to secure them which were prescribed by the Act of 1879. Occasionally, however, of late years he has used his influence to check division in the Nationalist party in Hungary (*e.g.* in 1893). He published two series of *Memoirs of my Exile*, and did a good deal of miscellaneous writing while in England. [GÖRGEY, HUNGARY.]

Kostroma, a Russian government lying between the governments of Yaroslaff on the W. and Viatka on the E. It has an area of 32,693 square miles, and the surface is undulating with hilly tracts on the right bank of the Volga, and flat marshy ground in the E. In the marshy part are many lakes, and there are still extensive forests of large timber. The capital, also Kostroma, is near the junction of the Kostroma with the Volga, and lies on the left bank of the latter river, its suburbs being on the right bank. It is 200 miles N.E. of Moscow, and is said to have been founded in 1152. Michel Romanoff was crowned here in 1613. There is a good cathedral, and the churches are numerous. Among the industries are cotton and linen factories, dyeing, tanning, and bark-mat making, and much brandy is distilled.

Kotah, a native state of Rajputana, India, having an area of 3,797 square miles, sloping gradually to the N. from the tableland of Malwa, and crossed from S.E. to N.W. by the Mckandarra range of mountains. It is fertile and well-cultivated, but the climate is extremely hot in the dry season, and in the wet season very unwholesome. The principal exports are opium and grain. The capital, Kotah, is a large, irregularly built walled city near the right bank of the Chumbul, and has some fine temples.

Köthen, a German town on the Ziethe, in the duchy of Anhalt, and till 1853 the capital of a principality, 22 miles N. of Halle and 31 S.E. of Magdeburg. It consists of an old town which

contains two palaces, one of them with a museum and library, and suburbs, and the cathedral has some old stained glass. The chief industries are iron-founding and agricultural-machine making, and the working of malt, sugar, lead, and spirits. Hahnemann established here an homœopathic institution.

Kotzebue, AUGUST FRIEDRICH FERDINAND VON (1761–1819), a German dramatist born at Weimar. He showed much literary precocity, and produced various kinds of writings at an early age. He entered the Russian service, and from 1814–16 was Russian Consul-General at Königsberg. His dramatic pieces, 200 in all, were published in 44 volumes (1827–29), and show much merit and artistic skill. He ridiculed the romantic school, and his leanings were towards absolutism, as is shown by his *Vom Adel* (1792), and these views eventually led to his being killed by a student at Mannheim.

Kotzebue, OTTO VON, the greatest of German navigators, second son of the above, was born at Revel in 1787. He made several voyages round the world, describing them in two works published respectively in 1821 and 1830. In 1816 he discovered the Sound near Behring Strait that bears his name. He died in 1846.

Koumiss, or KUMISS, a drink made from milk, either cow's, goat's, mare's, or ass's, in which slight alcoholic fermentation has taken place. It was first used by the Kalmucks. There are establishments in Russia for treating invalids with genuine koumiss.

Kovno, a Russian government, S. of Courland, bounded by Prussia and Poland, and just touching the Baltic Sea near Memel. It has an area of 23,000 miles, and forms part of the old Lithuanian government of Wilna, and is well watered by the Niemen, Aa, Wendau, and Duna, and has some fine forests. The majority of the population is Lithuanian, but there are many Jews. The capital, Kovno, partly in a valley and partly on the Vilia and the Niemen, which join in the neighbourhood, is an ancient town, one of the centres of Lithuanian commerce, and annexed by Russia in 1795. A railway passes through, and the town is rising in importance. There are no manufactures, and the chief articles of trade are timber, rags, flax, grain, and linseed. A cast-iron pyramid commemorates the French retreat in 1812.

Kra, an isthmus varying in breadth from 44 miles upward, and connecting Siam with the Malay peninsula. A plan has been formed for piercing the isthmus by a canal which would utilise the mouth of the Pakehan, which trends inland 17 miles to the N.E., and would pass through a low ridge of about 7 miles wide and enter the Gulf of Siam, thus shortening considerably the distance from Hong Kong to the Indian ports.

Krakatoa, or, more correctly, KRAKATAO, a volcanic island in the Strait of Sunda, between Sumatra and Java. It was formerly provided with coral banks, which abounded in turtles, and produced much rice and fruits; but in 1883

a volcanic eruption, which began in May and produced its greatest results on the 26-28th of August, almost destroyed the island, producing in place of what it carried away two small islands, which afterwards sank. An immense ocean wave was also created, which caused great devastation in Java and Sumatra and travelled round the world, while the quantity of volcanic dust which was discharged into the atmosphere produced some splendid sunset effects in our own hemisphere, which lasted through the latter part of the year for some considerable time afterwards.

Kraken, a sea-monster said to frequent the Scandinavian seas, where the fishermen often mistook it for an island (*cf.* Milton, *Paradise Lost*, i. 200-208). The first description we find was by Pontoppidan, Bishop of Bergen, in Norway (d. 1764). He made it $1\frac{1}{2}$ miles in circumference; but, like the great sea-serpent, it is not much believed in by scientific men. From his description of the creature seizing and dragging down ships with its enormous arms, the original of the myth would seem to be a gigantic cuttle-fish.

Krause, KARL CHRISTIAN FRIEDRICH (1781-1832), a German eclectic philosopher, was born at Eisenberg, and studied at Jena under Fichte and Schelling, and became a *privat-docent*. From 1805-13 he resided at Dresden and at Göttingen, where he lectured on philosophy 1823-30, going in 1831 to Munich, where he died. He was a contemporary of Cousin. Called by one critic *le philosophe à bascule*, he was one of the most eminent among the school of thought founded by Kant, though his practice of eschewing the technical terms generally in use in favour of native-coined words made much of his work difficult to understand. In 1810 he wrote on Freemasonry, and gave the Masons great offence. His *Ideal of Humanity* (1812) was translated into English, and he wrote on system in Logic, on Ethics, and on the Philosophy of Law and the Principles of Science.

Kreasote. [CREASOTE.]

Kredi (KREJ), a term of contempt applied by the Mohammedans collectively to the pagan Negro peoples of Dar-Zerbit and surrounding districts, South-East Sudan; they have not yet been visited by any European traveller, but are described by Schweinfurth on local reports as the ugliest and most debased of all Negro peoples.

Krefeld, manufacturing town and railway junction of Germany, 12 miles N.W. of Düsseldorf and 4 miles from the left bank of the Rhine. Its importance dates from the introduction of silk and velvet working by religious refugees in the 17th and 18th centuries. Its trade now amounts to nearly £3,000,000. The chief industries are iron-foundries, machine factories, railway repairing-shops, and its chief productions spirits, soaps, chemicals, etc.

Kremenchug, a Russian town on the left bank of the Dnieper, nearly 70 miles S.W. of Pultava, in which government it is situate. A railway tubular

bridge 1,081 yards long joins it to its suburb on the right bank of the river, and there is also a bridge of boats. Much timber is floated down the river, and there is a great trade in salt and tallow. Agricultural machines, carriages, wool, and leather are also articles of trade. There is good fishing in the Dnieper.

Kreuzer, or KREUTZER, the name of several German coins of silver or copper. The kreuzer of Frankfort was worth about the sixtieth part of a gulden, or one-third of an English penny. The Austrian coin of this name is worth one-fifth of an English penny.

Kriegspiel (WAR-GAME), a game of German origin, introduced in 1824 by Lieutenant von Reiszwitz, played with maps of a large scale and metal blocks coloured red and blue, representing bodies of troops of all kinds. An umpire, with two assistants, superintends the game, which is generally played by two persons with alternate moves. It roughly represents actual military operations, and the players are subject to general rules and special conditions. The game is played largely in the German army, and occasionally in England.

Krilof, IVAN ANDREOVITCH (1768-1844), a Russian writer and fabulist, who has been called the La Fontaine of Russia. He was born at Moscow, and, losing his father in 1782, he entered a public office, where he remained till 1788, when he quitted it for a literary career. Prince Sergius Galitzin made him his secretary, and in 1806 he received a Government appointment at St. Petersburg and an appointment in the Imperial Library in 1821. The latter part of his life was spent in comfort, and, as he was of desultory habits and careless of fame, he lived in much content. Some of his fables were published in the *Moscow Spectator* in 1805, and a collection of twenty-three was published in 1809, and followed by a further collection of twenty-one in 1811. His humour, satire, and deep sympathies won him general esteem, and his funeral was the occasion of a great display of admiration. He is commemorated by a bronze statue in the Summer Garden.

Kris, KREES, or CREESE, the national weapon of the inhabitants of the Malay Archipelago, is a kind of dagger. It is made in different sizes and shapes, and is worn by men of all ranks, some, indeed, wearing several, and in Java some women wear it. The kris is frequently ornamented and decorated.

Kronstadt, a trading town of South-East Transylvania, 261 miles S.E. of Pesth, on a line of railway, and near the Carpathians. It is about 1,800 feet above sea-level, and has a very mixed population of Saxons, Magyars, Czechs, Roumanians, Greeks, Armenians, and gypsies. Iron is largely manufactured here. [CRONSTADT.]

Kropotkine, PETER, PRINCE (b. 1842), Russian Nihilist, was born in Moscow. At the age of fifteen he joined the Corps of Pages, and at a later period served for five years in Siberia, where he made explorations. In 1867 he studied mathematics for

some time at the university of St. Petersburg, and became secretary of the Geographical Society. In 1871 he studied the glacial *débris* of Sweden and Finland, and in 1872, during a visit to Belgium and Switzerland, he became a member of the International. In 1874 he was arrested in Russia, escaped to England in 1876, expelled from Switzerland in 1881, and in 1883 imprisoned in France. On his release in 1886 he returned to England. He has written many articles in encyclopædias and elsewhere, and published *Paroles d'un Révolté* in 1885 and *In Russian and French Prisons* in 1887.

Kru (KROOMEN), a Negro people of South Liberia, whose territory extends for 220 miles along the Grain Coast; they appear to be of Mandingan stock, and are remarkable for their extraordinary physical strength and energy. Being also excellent boatmen and sailors, they are largely employed as crews by European vessels plying between the tropics on the West African seaboard. But for their aid the regular navigation of these waters would be almost impossible. They usually engage themselves for one or two years, and fulfil their part of the contract with great fidelity; but on returning to their homes they generally relapse into barbarism. Kru, sometimes supposed to be the English word "crew," is really a corrupt form of *Krao*, the correct tribal name. (R. Burton, *Wanderings in West Africa*, 1863.)

Krüdener, BARBARA JULIANA VON (1766–1824), author and religious enthusiast, was born at Riga, her father being the Baron von Vietinghoff. She married a Livonian noble, the Baron von Krüdener, but the marriage was not a happy one—she herself, in her novel *Valérie* (1803) be autobiographical, being not without fault in the matter. The husband went on an embassy to Venice, while the wife lived at Riga, St. Petersburg, and Paris. She then became enamoured of mysticism, and entered on the rôle of prophetess and herald of Russian success, and taught and preached, the Czar Alexander being one of her hearers. She then went from country to country, and finally retired to her estates at Riga, where she became attached to the Moravians. Her Greek sympathies brought her into trouble, and she died in the Crimea.

Krunsenstern, ADAM IVAN VON, Russian seaman and traveller, born in 1770 at Haggud, Esthonia, commanded in 1803–6 the first Russian scientific and commercial voyage round the world, of which he published a most valuable account. He was a frequent writer on hydrographical subjects in English periodicals. He died at Ass, Esthonia, in 1846.

Krupp, ALFRED (1812–87), the founder of the immense iron and steel works at Essen (q.v.). He was born at Essen, where his father had set up a small ironfoundry in 1810. He succeeded his father in 1848, the foundry then being still small and in a languishing condition. The discovery of the Bessemer process of converting steel and the invention of the Nasmyth hammer gave a great impetus to the demand for large forgings, and Krupp took full advantage of this demand, and

started the first Bessemer works and the first steam hammer in Germany, and was, moreover, the first to introduce the manufacture of steel guns, going on till he finally sent out guns of 100 tons and upwards, the first 100-ton gun being produced in 1880. He had already cast a steel block of 20 tons in 1862, and ten years later he cast one of 52 tons. The works at Essen are on a gigantic scale, employing a small army of workmen, and are still increasing under the management of the son of the above, who built a 135-ton gun for the fort of Cronstadt.

Kubachi, a branch of the Lesghian people, Kaitagh Mountains, Daghestan, East Caucasus. The name means "forgers of arms," and for centuries they have been famous for their skill in working the metals, and especially in making swords and coats of mail. Although for many generations Mohammedans, they have traditions of a time when they were Christians, and ruins of churches have been discovered, some dating back to the beginning of the 13th century.

Kubla Khan, the Grand Khan of the Mongols and founder of the Mongol empire of China, lived in the 13th century, and was the grandson of Genghis Khan. In the middle of the century he conquered North China—known to poets and early travellers as Cathay—and on the death of his brother was proclaimed "Great Khan," though not without incurring rivalry in the persons, first, of his brother Arikbuka, and then of another relative, whose opposition lasted throughout the reign. Kubla Khan was an energetic, enlightened ruler, adopting the Chinese civilisation, patronising literature, favouring the Buddhist religion by creating the office of Grand Lama, and in other ways. He overthrew all and sundry of his enemies, and possessed the most extensive of Asiatic empires, his sway extending from the Arctic Ocean to the Straits of Malacca, and from the Corea to Hungary. His was the first foreign dynasty to establish itself in China. Marco Polo visited his court, and his achievements gave rise to one of the opium-born fragments of the poet Coleridge, who tells us how—

"In Xanadu did Kubla Khan
A stately pleasure-dome decree,
Where Alph the sacred river ran
Down to a sunless sea."

Kubu, a savage people of Sumatra, who roam the solitudes about the Jambi and its affluents; appear to be akin to the Orang Abung, who are the aborigines of the Lampongs district. Stouter and taller than most other Sumatrans, they occupy an extremely low grade of culture, wearing no clothes beyond a few strips of bark, daubing the body with mud to protect it from the sting of insects, dwelling in frail huts made of branches or even in the hollow trunks of trees, eating reptiles, roots, and wild berries, without any chiefs or tribal organisation, but living in small family groups, and wandering from place to place accompanied by huge dogs, who warn them against the approach of men or beasts. (H. Forbes, *The Kubu of Sumatra*, in *Journal of the Anthropological Institute*, 1884.)

Kuenen, ABRAHAM (b. 1828), a Dutch theologian, born at Haarlem and educated at Leyden, where in 1855 he became a professor. His bold and original methods of criticism of the Scriptures wrought a revolution in Biblical criticism. His *Historisch-Kritisch Onderzoek naar het Ontstaan en de Verzameling van de Boeken des ouden Verbonds* was published in 1861-65, and in part translated by Colenso. He published a second edition of this work, also *De Godsdienst van Israel tot den Ondergang van den Joodschen Staat* (translated into English), and *De Profeten en de Profetie onder Israel*. He also wrote many articles and lectures on national and universal religions.

Kuen Lun, a great mountain-chain of Central Asia to the N. of the Great Plateau of Thibet, starting from the Pamir plateau, forming a curve to the N., and extending from long. 82° to 94° E. Having a width of 100 to 150 miles, with peaks rising to a height of 25,000 feet, and passes elevated to as much as 18,000 feet, it abounds in glaciers, and is liable to storms of snow and sand. The population is small, and the nomads occupying the upper valleys are pastoral.

Kufic Coins, name of early Mohammedan coins bearing inscriptions in the Kufic character—that is, in the epigraphic Arabic writing of Mohammed's time, named from the old city of Kufa (Cufa), south of Babylon, where the best copies of the Koran (q.v.) were written. Some bear the names of kings, califs, and governors not mentioned elsewhere.

Kugler, FRANZ (1808-58), a German art-historian, was born at Stettin, and studied at Berlin and Heidelberg. In 1833 he became professor at the Academy of Art and teacher in the university of Berlin. Besides poems, and a *Life of Frederick the Great* (1840), he published a *Handbook of the History of Painting from the Time of Constantine* (1837), a *Handbook of Art-Works in the Middle Ages in Prussia*, and a work upon colour in architecture and Greek sculpture.

Kuhhorn, ALPENHORN, or ALPHORN, a musical instrument formerly used by the Swiss to convey signals, now used by cowherds. Its length varies from 3 to 8 feet. It has a cupped mouthpiece, and the tube is nearly straight, but, curving at the end, widens into a bell. Instruments similar to this are used in Sweden, India, and South America.

Kuki, aborigines of North-East India, contemporary with the Nagas on the Burman frontier, are a branch of the Lushais, with eleven main divisions, numerous minor groups, and collective population of about 70,000, scattered over a territory some 7,000 square miles in extent. Each tribe is governed by a "king," assisted by a Council of Elders, and all are distinguished by some difference in their scanty costume. They worship the spirits of the elements, of rivers, forests, mountains, maladies, above all of whom is the great spirit Puthen, who is friendly to men, but knows all their acts, and judges and punishes the wicked both in this and the next life. (Dalton, *Ethnology of Bengal*.)

Kulja, a town of Zungaria in Central Asia, on the Ili, which rises in the Tian Shan Mountains and flows N. into Lake Balkhash, at the foot of the Irenkhabirga Mountains, and on the road from China to Western Turkestan. The town is mostly inhabited by Chinese, and is in a fertile district which is productive of corn, cotton, fruits, rice, tobacco, and wine. Horses, cattle, camels, and sheep are reared. The province was occupied by Russia in 1871, but was in part afterwards restored to China.

Kulm, a village of Bohemia, at the foot of the Erzgebirge, and three miles N.E. of Teplitz. Here in August, 1813, the French fought against an allied army of Prussians and Russians. On the first day of the battle the advantage was with the French, under Vandamme, but the Prussian army was reinforced in the night, and Vandamme was forced to capitulate after losing 20,000 men.

Kum, a walled city of Persia, on the road between Ispahan and Teheran, S. of the Kuru Kuh range, and 85 miles S. of Teheran. It is one of the most sacred cities of Persia, containing the tomb of Fatima, sister of the great Imam Riza, and being consequently visited by crowds of pilgrims. The desire of the faithful to be buried there has transformed the town and neighbourhood into a huge cemetery.

Kumans, a historical people of Turki stock, who formerly occupied the South Russian steppes, but were driven west by the Mongols in the 13th century, when about 40,000 crossed the Carpathians and took refuge in Hungary. Here they occupied the two districts of Great and Little Kumania in the north-west, where they became completely assimilated to the Magyars. Those left behind in Russia were sold into bondage by the Mongols, and many of the Mamelukes, who became the virtual rulers of Egypt, were descended from these captives.

Kumaun, a district of the North-Western provinces of India, having an area of 6,000 square miles. Part of it lies on the southern slopes of the Himalayas, and has a number of summits ranging to a height of 20,000 feet, and below this lies a great waterless jungle from 10 to 15 miles broad, and only broken here and there by the clearings of the hill tribes. The region produces iron, copper, lead, gypsum, asbestos, and tea. The capital is Almora, and the inhabitants are mostly Hindus.

Kumguat, the fruit of *Citrus japonica*, a small orange, not larger than many gooseberries, with sweet rind and sharp acid pulp. They are candied and exported from Canton in 3-lb. jars.

Kumi, i.e. "Men," the most numerous hill tribe of North Arakan, on both sides of the Kolading river; two main divisions, Kumi proper and *Kami*, with twenty-seven minor groups and collective population of 12,000; appear to be akin to the Kuki (q.v.), although the tribal relations in this region are greatly obscured by the confused and puzzling nomenclature.

Kunama (BAZEN), aborigines of Upper Nubia, province of Kassala, about the Mareb and Takazze affluents of the Nile; about 150,000 in a territory over 6,000 square miles in extent. All are still pagans of Negroid type, who, like the neighbouring Barea, have hitherto maintained their independence both against the Abyssinian Christians on one side and against the Arab Mohammedans on the other. Hence a perpetual state of warfare, which has earned them a bad name, and which makes them extremely jealous of any strangers penetrating into their territory. Matriarchal practices still survive amongst these rude tribes, who, from their speech, appear to be originally Hamites, despite their extremely dark complexion and other Negro features. (James, *Wild Tribes of the Sudan*, 1883.)

Kunersdorf, a Prussian town in the province of Brandenburg, near Frankfort-on-Oder, 40 miles E. of Berlin. Here Frederick the Great received an important defeat on the 12th August, 1759, in the course of the Seven Years' War.

Kunjara, a people of East Sudan, who were the ruling element both in Darfur and Kordofan before the arrival of the Egyptians. They are a branch of the Fur race, from which Darfur (Dar-Fur = Fur-land) takes its name; irregular features, very dark complexion, rude habits, speech apparently akin to that of the Nubas of Kordofan.

Kupfer Nickel, an important ore of arsenic, which consists of the arsenide of nickel (NiAs). It does not contain any copper, though its name apparently indicates this metal. It occurs largely in Saxony, Norway, Connecticut, Cornwall, and other localities as a hard copper-coloured mineral of specific gravity 7.5, which sometimes occurs crystallised in forms belonging to the hexagonal system.

Kurama, a Tatar people of East Turkestan, province of Syr-Daria, are Kirghiz who have abandoned the nomad state and become agriculturists, intermingling with the Uzbeks and the Sartes; population, 78,000, mainly confined to the Kurama district about the Chirchik and Angren rivers.

Kurdistan, a geographical district of Central Asia, lying partly in Persia and partly in Turkey in Asia. The Euphrates forms its western boundary. The Turkish portion, which is watered by the Great Zab, is varied by high mountains clothed with thick forests, and by fertile valleys which produce corn, rice, sesame, cotton, fruits, honey, tobacco, and wax; while in the hills are found sulphur, orpiment, and alum. The Persian district is part of the ancient kingdom of Media, and, though mountainous, is fertile, producing wheat, barley, rice, hemp, flax, sesame, cotton, fruits; while there is much rearing of horses, camels, cattle, sheep, and goats. With regard to the district at large, game is abundant in the mountains, and the panther, bear, lynx, jackal, hyena, and fox are numerous. In the valley of the Kermonchah woollen goods, goat's hair, felts, and carpets are largely worked. The country is very ancient, and was the seat of much mythological history. The

original people, known variously to the ancients as Curdi, Gordi, Gordyæi, Gordiani, and Carduchi, came into contact with Xenophon during his famous retreat. Timour conquered them in 1388, and they now number about a million. The renowned Sultan Saladin was a Kurd.

Kurds, the *Karduchi* of Xenophon, a branch of the Iranian Aryans, who form the bulk of the population in Turkish and Persian Kurdistan ("Land of the Kurds"), but who are also found in scattered groups in Khorassan, Asia Minor, and Syria; social organisation still essentially tribal, hence divided everywhere into countless clans and septs. The four great divisions of Kurdistan are the *Bohtân*, *Bahdinân*, *Hakari*, and *Rowandiz*, mostly lawless nomads and Mohammedans, but some settled agriculturists and Christians; type, oval face, deep-set dark or blue eyes, broad retreating brow, well-formed nose and mouth, small hands and feet, fair or very light-brown complexion; speech allied to West Persian, but rude and little cultivated, written both with the Arabic and Armenian characters.

Kuriles, the aborigines of the Kurile Archipelago between Kamchatka and Japan. In the 18th century they occupied the whole group, but are now restricted to three of the five inhabited islands, and even here are disappearing; for some time have been Christians of the Russian Church, and in other respects are assimilated to the Russified Kamchadales.

Kuriles, THE, a chain of twenty-six islands extending for nearly 800 miles, from Cape Lopatka, S. of Kamchatka, to the E. of Yesso in Japan, and separating the Sea of Okhotsk from the Pacific Ocean. In 1875 Japan surrendered the southern part of Saghalien to Russia, and received in return the Northern Kuriles. The largest islands are Iturup and Kunashiri, which are visited by seal-hunters. A small remnant of pit-dwellers—said to have come originally from Yesso—is to be found, and there are a few Japanese and other inhabitants; but most of the islands are only visited for the summer fishing.

Kurrachee, the capital of the district of the same name in Sindh, is the chief port for the Punjab, and is situated at the extremity of the Indus delta and close to the frontier of Baluchistan. It is the terminus of the South Punjab and Delhi railway, being 116 miles distant by rail from the latter town, though only half that distance direct. The large harbour is sheltered by a breakwater and a reef, at the end of which is a fixed light. The minimum depth of water on the bar is 20 feet, and the landing-place on Kamari island communicates with the town by the Napier mole, three miles long, which was constructed in 1853. Nearly half a million has been spent on harbour improvements. The town is modern, and contains little of interest. There is a Frere Hall, with museum and library, and near the cantonments to the E. and N. is a public garden of 40 acres. The water supply is good, and the town is healthy. The trade, to the amount of seven millions annually, consists of the export of cotton

from Sindh and the Punjab, wheat and oil-seeds, and an inland trade with Afghanistan and Baluchistan. There are also iron-works and cotton-presses. The Kurrachee district contains 14,115 square miles.

Kursk, a Russian government in the middle of South Russia, contains about 18,000 square miles, and is watered by tributaries of the Dnieper and Don. About three-fourths of the surface is arable, and the district produces chalk, iron-stone, mill-stones, and potter's clay. There are many barrows. The capital, Kursk, is 312 miles S.W. of Moscow, and is celebrated for the Easter fair, Korennaya, held near it, where transactions to over the amount of £1,000,000 till recently took place. The chief industries are tanning, and soap, candle, tobacco, and spirits manufactures.

Kurumbas, aborigines of the Nilghiri Hills, South India; one of the most degraded types of the human race—long black shaggy hair, very black complexion, bridge of nose depressed, gaping nostrils, projecting jaws, low stature, wild expression; seem to represent a primitive Negrito element, but now speak a rude dialect of the Malayalam (Dravidian) language.

Kutenays (KUTANIS), North American aborigines of British Columbia, about the northern fork of the Columbia river, and thence southwards along the Kootenay river, named from them; speak a stock language unrelated to any other in North America; chief divisions, Upper Kutenay. Lower Kutenay (Akoklako), Klanoh-Klatklam (Flathead Kutenay), Yaketahnoklatakmanakay; are at present (1893) reduced to less than 1,000 souls, of whom 425 are in the Flathead Agency, Montana, and 540 at Kutenay Agency, British Columbia.

Kutosoff, MICHAEL LARIVONOVITCH (1745–1813), Field-Marshal and Prince of Smolensk, studied at Strasburg, where he displayed great fondness for literature, a taste which remained with him throughout his military career. At the age of sixteen he entered the artillery, and mounted rapidly, but lost an eye in one engagement, and was again severely wounded in another. In 1791 he won the battle which led to the Treaty of Jassy. Catherine II. sent him on an embassy to Constantinople, and made him Governor of Finland. Paul I. employed him on many missions, and Alexander I. made him Governor of St. Petersburg. He fought at Austerlitz, and was engaged against the Turks in 1809. In 1812 he was opposed to Napoleon, and was defeated at Moskowa, but his Fabius-like policy stood him in good stead, and he won the name of Smolenski at the battle of Kranoi. He followed the French retreat into Germany, where he died. He stands next Suwarrow in reputation, and was known as “the Saviour of Russia.”

Kutzo-Vlachs, an isolated group of Rumanians on both slopes of the Pindus range, Balkan Peninsula, mixed with numerous Albanian and Greek elements, speak a corrupt Rumanian dialect, which the Rumanians of Wallachia and Moldavia have much difficulty in understanding. Kutzo-Vlach, meaning “Crippled Wallachians,” is a term of

contempt applied to them by the Greeks; population about 200,000.

Kuy, aborigines of Camboja, called *Khmer-dom*, i.e. “original Khmers” (Cambojans), and regarded as the primitive stock of that race; eight divisions, chiefly N. of the Great Lake about the frontiers of Camboja and Siam; are noted workers in iron; speak several distinct and mutually unintelligible idioms, but are gradually becoming absorbed in the surrounding Cambojan and Siamese populations.

Kyanite, a mineral silicate of alumina, $Al_2O_3SiO_2$, crystallising in the Anorthic system in long crystals often twinned, translucent, glassy and various in colour, infusible, unaffected by acids, and with a hardness of 7 and a specific gravity of 3.5–3.7. It occurs especially in metamorphosed slates.

Kyoto, or KIOTO, for a thousand years the capital of Japan, 26 miles inland from Ozaka, stands on a plain divided by a lofty range of hills from Lake Biwa to the E. There are some fine temples on these hills, and beneath lies the town, whose main streets are parallel to the river Koma, which flows at the base of the ridge. Kyoto is the centre of the Buddhist faith in Japan, and there are Buddhist temples at the S. end of the city. At the N. end are wooden buildings, formerly inhabited by the emperors. The town produces embroidery, enamels, inlaid bronze, brocades, crapes, velvets, porcelain, and pottery, and is noted for its dancing girls.

Kyrie, in full, *Kyrie Eleison* (Greek = “Lord, have mercy”), the title of a short prayer used as a response in early liturgies, and at the beginning of the Roman Mass and the Anglican Communion Service; also the name of a musical setting of the same petition.

Kyrle, JOHN (1664–1724), a philanthropist who lived at Ross, in Herefordshire, and was immortalised by Pope as “the Man of Ross.” On an income of £500 a year he built hospitals and churches, and did other good works. A society formed by Miss Octavia Hill and others for bringing light and sweetness into the dwellings and surroundings of the working-classes and the poor has been called the Kyrle Society.

L.

L, l, the twelfth letter and ninth consonant of the English and Latin alphabets, derived through the Greek *lambda* from the Phœnician *lamed*, and ultimately from the Egyptian hieroglyph of a couchant lion. It is a voiced consonant produced by placing the tip of the tongue against the upper interior gums (as in English), or against the inside of the upper teeth, and then breaking the contact after letting a slight murmur escape over the sides of the tongue. The Welsh *ll* is a kindred voiceless sound, a strong audible breath passing over the sides of the tongue just before the contact is broken. At the end of monosyllabic words this letter is written double after single vowels. Sometimes *l* before a consonant and after *a* modifies the *a*, as does final *ll*, except in *shall*, e.g. *halt*, *salt*, *falter*,

appalling, taller, call, fall: and sometimes *l* in the middle of a word is silent after the broad *a*, as in *calf, half, calm, palm*. The sound in the French word *mouillée*, the Italian *gl*, is nearly English *ly*. The *l* murmur, or sonant *l*, is often written *le* in English, as in *sickle, single, little, fiddle, simple, double*, and unaccented *al, el*, often have this sound. The voiceless *l* murmur is heard in the French *temple*.

Labarum, the famous Imperial standard of Constantine the Great after his vision of the cross and his conversion to Christianity. It is usually represented as a pole with a cross-bar, on which hung a purple banner with the Greek letters X P (*Chr*, the beginning of *Christos*) interlaced.

Labiataë, the fifth largest natural order of Dicotyledons (q.v.), including nearly 3,000 species under about 140 genera. They are mostly natives of warm or temperate regions, are all herbs or undershrubs, and have in almost all cases aromatic carminative volatile oils. They have stems which are generally square; opposite, decussate, exstipulate leaves; flowers in verticillasters (q.v.); a persistent gamosepalous calyx of five sepals, a bi-labiate gamopetalous corolla of five petals; didynamous stamens; and two carpels, splitting into four one-seeded superior nutlets, with a gynobasic style. Mint, sage, lavender, rosemary, and thyme are familiar representatives of the order.

Labiate, or LIPPED, is practically an abbreviation of bi-labiate, being a term applied in botany to gamophyllous calices or corollas in which widely-gaping lateral sinuses divide the limb into two lips. In the corolla of the order Labiataë (q.v.) the posterior lip is composed of two petals and generally forms a hood over the essential organs, while the anterior lip, of three petals, known as the *labellum*, is the landing-place of the fertilising insect visitants. In honeysuckle the posterior lip consists of four petals and the anterior of one only, both lips being reflexed.

Labrador. [NEWFOUNDLAND.]

Labradorite, a variety of plagioclase felspar (q.v.), named from Labrador, where it occurs in great quantity in rocks of Archæan age. It contains about 53 per cent. of silica, 30 per cent. of alumina, 12 per cent. of lime, and nearly 5 per cent. of soda. It is generally grey, and exhibits a rich play of colours, chiefly blue and green, due to included fibres, for which reason it is sometimes used in jewellery. $H = 6$, S.G. = 2.67 – 2.76. It is a constituent of basalts and diabases.

Labrador Duck (*Somateria labradorica*), a large duck allied to the Eider Duck, now extinct, but formerly valued for its down. The last-known specimen is said to have been killed in Halifax harbour in 1852. A few examples are preserved in museums.

La Bruyère, JEAN DE (1645–1696), the author of the *Caractères*, published in 1688, was a very distinguished French writer. The satires in his work made many enemies, but he was, after being twice rejected, elected to the French Academy.

His other work, *Dialogues sur le Quietisme*, did not attain the popularity of the *Caractères*.

Laburnum (*Cytisus Laburnum*), a favourite tree in our gardens, belonging to the pea tribe and to the same genus as the broom (q.v.). It is a native of the south of Europe, and was introduced into England in the 16th century. The heart-wood is very dense and dark-coloured, resembling ebony, and is used in turnery. The leaves have a white down beneath, which, with the downiness and many-seeded character of the pods, distinguishes the tree from the so-called Scotch laburnum (*C. alpinus*). *C. Adami* is a hybrid between the laburnum and the shrubby *C. purpureus*, perhaps originating in a graft (q.v.). The roots and leaves of laburnum are poisonous, and the seeds dangerously so. They contain two poisonous alkaloids, *cytisin* and *laburnin*, and have a powerful emetic action.

Labyrinth, in classical antiquity, was a building full of intricate passages. Of mythical labyrinths the most famous was that constructed by Dædalus for Minos, King of Crete, and inhabited by the Minotaur, which devoured all who entered. The name was afterwards applied to real buildings of the same character, such as the Egyptian labyrinth, near the town of Arsinoë. In modern gardening a labyrinth, or “maze,” is a series of intricate walks enclosed by high and thick hedges, which makes it difficult to recover one’s way when it has been lost. The most famous in England is that at Hampton Court.

Labyrinthodonta, an extinct order of Amphibia (q.v.), of which *Archegosaurus* in the Coal-measures is perhaps the oldest known, and *Labyrinthodon*, in the Trias, the most recent. They all possess tails, and some seem to have been serpentine-form, and possibly devoid of limbs. Much of the skeleton was cartilaginous, and is therefore unknown to us: the occipital condyles were often permanently so; and in *Archegosaurus* the notochord persisted, and we have only bony rings in the vertebræ as in a tadpole. A dermal armour of scales occurs in many genera. The name is derived from the labyrinthine involutions of the walls of the teeth in some genera. The large footprints in Triassic rocks formerly known as *Cheirotherium* are almost certainly those of *Labyrinthodon*. As the skull is in some cases three feet in length and two feet broad, these animals certainly reached a colossal size.

Lac, a resinous incrustation formed on the twigs of various East Indian trees by the puncture of an insect, *Coccus lacca*. The name, meaning a hundred thousand, suggests the number of these insects, which pierce the bark with their proboscides and cover themselves with the resinous exudation. A red fluid collecting in the enlarged ovary of the female insect forms the lac-dye of commerce. Lac encrusting the twigs is known as *stick-lac*, and contains about 68 per cent. resin and 10 per cent. lac-dye. Stick-lac crushed and washed becomes *seed-lac*, and this when slowly melted in a cloth bag and spread out in thin layers on glossy plantain leaves constitutes *shell-lac* or *shellac*. Lac

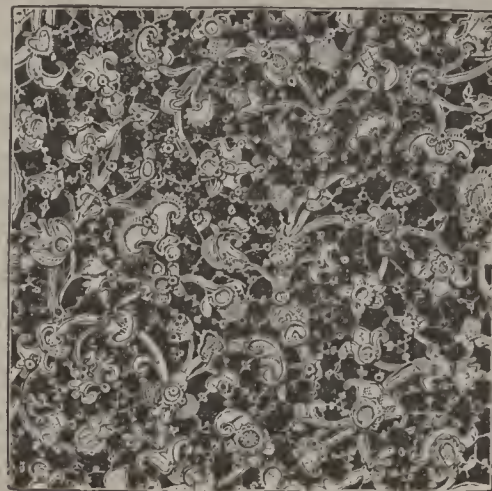
comes chiefly from Bengal, Assam, Pegu, and Siam. 5,650 tons of shellac being exported in 1890, mostly to England. Lac is a principal ingredient in sealing-wax (q.v.) and in many varnishes.

Lac-dye is a red colouring matter obtained from *lac* (q.v.). It is usually obtained from the crude *stick-lac* by maceration with water and precipitation with milk of lime. The colour is due to a substance, *Laccaic acid* ($C_{16}H_{12}O_8$?), present in the *lac-dye*. It has long been used in the East for silk and wool, and formerly it was very extensively used in Europe, chiefly in combination with cochineal, but later years have seen it diminish greatly in importance.

Lace, a fabric made by twisting, plaiting, knotting, or looping fine threads of linen, cotton, or silk, so as to form an ornamental design. In the different kinds of lace various methods are adopted for filling in the space between the main lines of the pattern (called the "flower" or "gimp") so as to hold it together. One of the commonest "grounds" is a mesh of very delicate texture, resembling a honeycomb, which is termed a *réseau*; its most familiar form is the bobbin-net, now produced by machinery. The pattern and *réseau* may either be worked together, or the former may first of all be made separately, and then stitched down to the *réseau*; in the latter case—*e.g.* in Honiton lace—the work is called *appliqué*. Sometimes the ground consists merely of single threads called "ties" or "brides," or there may be hardly any ground at all, the design being such that the various parts touch here and there at the edges, and so give one another mutual support.

Lace may be either hand-made or machine-made. Of the former, often distinguished as "real" or "genuine" lace, there are two kinds, *needle* or *point-lace* and *pillow-lace*. Hand-made lace is usually made from linen-threads, whereas in machine-made lace the material commonly used is cotton. The art of making *point-lace* originated in Venice, where it was developed by gradual stages from embroidery-making in the earlier half of the 16th century. The first true lace, as distinguished from embroidery, was the *punto in aria* or *reticella*, which differed from modern lace only in the more elementary character of the work, and the invariable choice of rectilinear or geometrical patterns. The skill of the lace-makers of Northern Italy continued to increase during the next two hundred years, reaching its climax in the rich variety called "rose-point," which was produced in the early years of the 18th century. It consists of flowers and scrolls worked in relief as though they were embossed or carved, and joined together by ties or brides ornamented with *picots* (small loops running along the edge of the tie). From the North of Italy the art was carried to Flanders and France; in the latter country its course was extremely prosperous, and there are few varieties of needle-point which can rival the Alençon lace of the 18th century. Point-lace is made in the following manner:—The design is first of all drawn on a sheet of parchment, which is then stitched down to a piece of stout linen. Linen threads are then placed over the chief lines

of the design, stitches being introduced here and there to fasten them on to the parchment and linen backing. The space within the threads, which form the outline of the pattern, is gradually filled in with button-hole stitches; when this is finished, the



POINT LACE.

stitches by which the pattern is attached to the parchment and linen are cut through, and in this manner the now completed lace is set free.

The manufacture of pillow-lace arose, either in Flanders or in Italy, towards the close of the 15th century. It thrived chiefly in Flanders and in England, where it was introduced by Flemish refugees in the latter part of the 16th century. The new industry was established at several places in the south-western counties, the most important being Honiton in Devonshire. Although the importation of foreign lace was prohibited from the reign of Charles II. onwards, smuggling was carried on extensively, and much of the lace sold as Honiton was really made in the Low Countries. Pillow-lace is so called because the worker holds on her knees a pillow with a piece of parchment fixed to it on which the pattern has previously been drawn. The parchment is pierced with holes at certain points on the outline of the pattern to mark the place where pins are to be inserted; this is an operation requiring special knowledge and skill. When the pins have been placed in the holes, the threads of lace are plaited and twisted round them from a large number of small bobbins. Sometimes as many as 1,200 bobbins are used, and the work is so intricate that the skilled lace-maker completes only about one inch in three weeks. Amongst the more important foreign laces of this class are those of Mechlin and Valenciennes. Mechlin lace is celebrated for its *réseau*, which is composed of a number of hexagons, four of the sides consisting of double twisted threads, while in the two others the threads are plaited three times.

Machine-made Lace. Much ingenuity has been shown in the invention of machinery for making "imitation" lace, but, from an artistic point of view, work which merely consists of threads twisted together can never compete with that which is produced by means of the button-hole stitch or the regular plait. The manufacture of lace in this manner grew up in the 18th century, the first machine used for the purpose being the hosiery-frame, by means of which it was found possible to

produce the net or mesh. The greatest advance was the invention of the Leavers machine (1813), which is now used at Nottingham and other centres of the lace industry. In spite of the inferiority of machine-made lace, it has driven hand-made lace almost completely from the field, and the attempts to revive the art in Ireland, at Honiton, and elsewhere have met with but scanty success.

Lacertidæ. [LIZARD.]

La Chaise, FRANÇOIS D'AIX DE (1624-1709), an ardent Jesuit, became the confessor of Louis XIV. in 1675. In the contest between Jansenists and Jesuits (q.v.), he avoided a violent position and maintained the king's favour until his death.

Lachrymal. [EYE.]

Lacquer, a varnish of two kinds. (1) That applied to brass and other metals to preserve them from corrosion and tarnish consists of shell-lac or seed-lac dissolved in alcohol, with the addition of certain gum-resins and some colouring matter, such as gamboge. The metal surface is usually coated twice; the first coat may be applied when it is either hot or cold, but it is invariably heated before receiving the second. (2) The lacquer used for decorative woodware is derived from the juice of the *Rhus vernicifera*, or "lacquer-tree," which is prepared in various ways, according to the kind of lacquerware desired—e.g. for gold lacquerware it is mixed with about 30 per cent. of powdered gold. The processes followed in applying the successive coats of lacquer are extremely elaborate and slow. Frequently a design in relief in one kind of lacquer is placed upon a ground consisting of another kind. It is also common to carve the surface or to inlay it with plaques of metal, ivory, or mother-of-pearl. The art of lacquering has been carried to the highest degree of perfection in Japan, where it has been practised for at least a thousand years.

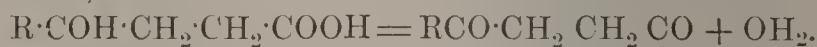
Lacrosse, a Canadian game, originally derived (though in a much ruder form) from the Indians. It is played with a *crosse*, a stick about 6 feet long, curved at one end like a bishop's crozier (whence the name), and an indiarubber ball from 8 to 9 inches round. The game was introduced into England in 1867.

Lactic Acid. This acid is present as a constituent of very many natural products, as in the sap of the vine, in certain parts of the body, and in fermented liquids. It occurs in sour milk (hence name), being formed by the fermentation of the milk-sugar, and in this source it was first discovered in 1780 by the Swedish chemist Scheele. It is best prepared by the fermentation of sugar, induced by adding some putrid cheese, sour milk, and zinc carbonate to the solution of sugar and allowing it to stand in a warm place. The sugar first forms *glucose*, and this breaks down according to the equation $C_6H_{12}O_6 = 2C_3H_6O_3$. It may also be prepared by numerous synthetic methods, which prove its constitution to be $CH_3\cdot CH_2\cdot OH\cdot COOH$, or *α hydroxy propionic acid*. It is a colourless, thick liquid soluble in water, and of specific gravity 1.2. Besides this ordinary lactic acid, an acid of

precisely the same constitution is obtained from flesh, called sarco-lactic acid, which only differs from the previous acid by acting on polarised light. [ISOMERISM.] Another isomeric acid is hydracrylic acid, which, however, differs in many of its properties from lactic acid and has not the same constitution. Another variety has been also described, but its existence not well proved.

Lactometer is an instrument for testing the quality of milk. One form of lactometer is a hydrometer to which is attached a scale about five inches long, the zero of which marks the point to which it just sinks in water. Another point on the scale corresponds to an average quality milk, and according as this mark sinks below or rises above the level of the milk, the milk is said to be more or less diluted with water. The instrument is not scientifically accurate, as the addition of either cream or water would cause the instrument to sink. Another form is a simple glass tube graduated in 100 parts. New milk is poured in and left to stand. The cream rises, and its height gives the number of parts of cream in 100 parts of milk. Sets of these tubes are used by farmers for comparing the quality of the milk given by different cows.

Lactones. Organic acids which contain a hydroxy group as well as the acid group CO_2H frequently undergo a change with the elimination of water and formation of a chain compound. Thus,



The chain compounds are known as lactones, and furnish many important chemical products.

Lactose, or MILK-SUGAR, is a member of the sugar group carbohydrates, and is closely allied to cane-sugar. It has the chemical composition represented by $C_{12}H_{22}O_{11}$. It forms a crystalline solid soluble in water and possessing a sweet taste, though not so sweet as that of cane-sugar. It acts on polarised light, being dextro-rotatory. [POLARISATION.] It does not ferment, yielding alcohol under the action of yeast; but if boiled with a dilute acid, or subjected to the influence of certain ferments, it yields a sugar *galactose* ($C_6H_{12}O_6$), which then yields alcohol as a product of the yeast fermentation. It, however, undergoes fermentation under the influence of an organism known as *bacillus acidi lactici*, present in sour milk or putrid cheese, and yields *lactic acid* (q.v.), and on further fermentation *butyric acid*. As lactose is itself present in milk, this fermentation is the cause of milk turning sour when exposed to air. [SUGARS, CARBOHYDRATES, FERMENTATION.]

Lady-Birds, or COCCINELLIDÆ, a family of small variously coloured beetles. They are usually black, with red or yellow spots, or *vice versa*. They are of the greatest service to agriculturists, as they feed on plant lice (*Aphides*).

Lady-Day, the Feast of the Annunciation of the Blessed Virgin (March 25). It is a quarter-day in England and Ireland.

Lady's Mantle, the popular name of the rosaceous genus *Alchemilla*, especially *A. vulgaris*, from its roundish, 7- to 9-lobed, plaited, and serrate leaves. Those of some alpine species have long silvery hairs. Root-pressure bedews the teeth of the leaf with drops of water. The stipules are ochreate (q.v.), and the minute greenish flowers, which are numerous, are interesting from their symmetry being often tetramerous, their ring-shaped perigynous disk, and their solitary one-seeded carpel on a gynophore (q.v.), with a lateral style and forming a single achene (q.v.). The common species is administered as a tonic by herbalists.

Lady's Slipper (*Cypripedium Calceolus*), formerly known as *Calceolus marianus*, one of the rarest of British orchids. The genus includes some fifty species from various tropical and temperate regions. The large inflated lip-petal gives its name to the group, and it differs from other orchids in having the outer anterior stamen aborted and two inner lateral ones polliniferous. There is also a pedicellate 3-lobed discoid stigma. Many of the species are favourite stove-plants.

Lafayette, MARQUIS DE (1757-1834), took a leading part in the American War of Independence; he was entrusted by Washington with the defence of Virginia, and took part in the battle of Yorktown. After the war he returned to his native country, and endeavoured to make his influence felt in the French revolution; he was disliked, however, on account of his moderation, and was in 1796 captured by the Austrians. Liberated by Bonaparte, he again entered the field of politics after the latter's fall.

Lafontaine, JEAN DE (1621-1695), passed a very uneventful life at Paris. His great works, the *Contes et Nouvelles en Vers*, and the *Fables* appeared in 1665 and 1668. In 1684 he was elected to the Academy. His work is thought very highly of by his countrymen, and takes a high place in the world's literature.

Laforey, SIR JOHN, BART., British naval officer, was born in 1729. He took part in Keppel's action off Brest in 1778, and in the following year was made commissioner at Antigua. In 1783 he became commissioner at Plymouth, and remained there until, in 1789, he was created a baronet and rear-admiral, whereupon he assumed command at the Leeward Islands. He effected the reduction of Tobago, and returned to England in 1793, but in 1795, immediately after his promotion to be admiral, was reappointed. He died in 1796. His son, SIR FRANCIS, born in 1767, was also a distinguished officer. He died an admiral in 1835.

Lagomys, the only living genus of the Double-toothed Rodent family Lagomyidæ, with eleven species, known as Pikas or Calling Hares, and about the size of guinea-pigs. They are chiefly from the north of Asia and America, though one form, the Alpine Pika (*L. alpinus*), ranges into south-eastern Europe. They store herbage in and near their burrows, and the sable-hunters are said to appropriate the stores of the Alpine Pika to feed their horses.

Laissez Faire, a system of State policy which consists in refraining from legislation on economic and social matters, on the ground that national welfare is best promoted by allowing free scope to individual enterprise. The principle was adopted in a greater or less degree by the French Physiocrats and Adam Smith; and the "Manchester School," the most prominent members of which were Cobden and Bright, urged it with a vehemence which sometimes amounted almost to fanaticism, objecting not only to restrictions on foreign commerce [FREE TRADE], but to all interference with industry on the part of the State, including even the Factory Acts and similar legislation. The term is now used in a wider and more general sense; in fact, it may be regarded as co-extensive with the whole sphere of government. The views on which Laissez Faire, in its full signification, is based may be considered as the outcome of the struggle for individual liberty which culminated in the French Revolution. Since the growth of the theory of Evolution it has been connected with the doctrine of the "struggle for life," and is now ably advocated by such men as Herbert Spencer and Professors Huxley and Tyndall. Regarded as a system of political doctrines resting on some philosophic basis, the principles of Laissez Faire are usually termed "Individualism" as opposed to Socialism (q.v.).

Lake-Dwellings, a collective name for houses, either isolated or in groups, built on some kind of substructure above the surface of the water, usually of inland lakes. Probably the motive which led to early man choosing such situations for his villages was the sense of security derived from being thus cut off from attack. The first known mention of such dwellings is by Herodotus; but dwellings of this kind go back to even earlier times than those described by the Father of History. In the winter of 1853-54 the attention of anthropologists was directed to the dwellings of the Swiss lakes owing to the water falling below the usual level, and a little later to those of Italy. Dr. Keller considers it "extremely probable that the Swiss lake-dwellings reach back from 1,000 to 2,000 years before our era." From relics found they appear to have been inhabited during the Stone, Bronze, and Iron Ages, and the finds range from stone implements to a coin of the Emperor Claudian. There were three styles of building used in the platforms on which dwellings were erected. (1) Piles were driven into the bottom of the lake, and stones dropped between them to render the structure firm. (2) In some cases the piles were mortised into the trunk of a tree, and then lowered into position. This was chiefly done on sandy bottoms, where the piles if driven would have little hold. (3) The stems and branches of small trees and brushwood were thrown in till a sufficient foundation was laid on which to erect the platform. The last was substantially the plan followed in the erection of the crannogs of Britain and Ireland, though sometimes naturally islands were utilised, and the whole surrounded by a palisade. In 1856 traces of a lake-dwelling were found at Wretham in Norfolk. Ten years later,

some remains possibly of pile-building, with bones, Samian pottery and Roman coins were discovered near London Wall and in Southwark. In 1887 vestiges of such dwellings were met with in Baston Mere, near Bury St. Edmunds, and also on an



LAKE DWELLING.

island supported by piles in Llangorse Lake, Brecknockshire. In 1880 there was a find at Ulrome in Yorkshire, and some three or four years afterwards evidences of a pile-dwelling were found near Preston, in Lancashire. One of the most important finds in Britain was that in 1892, when, about a mile north of Glastonbury, beams and piles closely resembling those of the Scottish and Irish crannogs were discovered. These extend over five acres, and show traces of from 60 to 70 separate dwellings or work-places. There have been found bronze rings, fibulæ, a brooch, a few iron objects much decayed, a quantity of broken pottery, remains of a quern, some stone implements, and flakes and cores of flint. Most of the articles are late Celtic. The age of lake-dwellings is by no means past. They are to be met with at the present day in Africa, New Guinea, and the Malay Archipelago.

Lakes are bodies of water occupying hollows of the land, either with an outlet, when their waters are fresh, or without one, when they are salt. They vary in size from the salt Caspian, 170,000 square miles, to the fresh water Superior, over 30,000 square miles, and Victoria Nyanza, but little less. In elevation they range from Sir-i-kol, the source of the Oxus, 15,600 feet above sea-level, and Titicaca, 12,800 feet, to the Caspian, the surface of which is 85 feet, and the Dead Sea, the surface of which is 1,272 feet below sea-level. In depth, Lake Baikal, with an area of 9,000 square miles—about that of Lake Erie—the largest body of fresh water in Asia, exceeds all others, being 4,080 feet, with its surface 1,360 feet above, and its bottom 2,720 feet below, sea-level. But the bottom of the Dead Sea is 2,580 feet, and that of the Caspian 3,685 feet below sea-level. Lake Como is rather deeper than the Dead Sea, but Tanganyika, Geneva, Superior, and the deepest Scottish lakes are about 1,000 feet in depth. Lakes have originated in a variety of ways. Some are the craters of dormant volcanoes, such as Lake Albano, near Rome. Others, known as *lagoons*, are formed on low sandy coasts by storm-beaches, and are commonly brackish, as in the Landes of Bordeaux. The upheaval of

surrounding land has formed many large lakes, such as the Caspian, the great Equatorial lakes of Africa, and those of Switzerland and Italy, in which animals closely allied to marine forms suggest a former connection with the ocean. The great series of lakes in the St. Lawrence basin, the greatest area of fresh waters on the globe, have been compared to an elevated Baltic. The depression of a plain has been another cause, as in the Jordan valley, with the fresh-water Tiberias 600 feet below sea-level, and the Dead Sea 100 miles farther south and nearly 700 feet lower. The waters of a lake may be held up by ice, like the Merjelen See on the Aletsch glacier, or may have been dammed back by a landslip, a lava-stream, a glacial moraine, or the work of beavers. Hollows produced by irregularities in boulder-clay left on the melting of an ice-sheet, and *rock-basins* scooped out of solid rock on the lower slopes of once glaciated mountains, form the *tarns* of northern mountains. The subsidence of rock-basins along a coast-line has produced fjords (q.v.). Lakes in the course of a river act as filters, and so tend to become choked by the fans of growing deltas carried into them, and they also act as flood-regulators during heavy rain. Salt lakes vary much in salinity and in composition. Aral has less than 11 grams of salt per 1,000, the open Caspian less than 13, Van over 17, the Dead Sea 221, Urumiah nearly 223, and Karabog haz Bay in the Caspian 285 grams. In the Caspian, Dead, and Urumiah Seas the salt is mainly chlorides of soda and magnesia, with notable proportions of chloride of potash and lime in the Dead Sea; but Van contains a large proportion of carbonate and sulphate of soda, and is thus alkaline rather than saline. Other smaller lakes in Tibet, California, etc., contain borax (q.v.).

Lakes. The term lakes as applied to pigments is derived from an Italian term—*laccæ*, which was given to pigments obtained from dye liquors. In dyeing it is frequently necessary for the formation or fixation of colour to mordant [DYEING] the cloth before or after subjecting to the dye. If, instead of thus forming the pigment in the cloth, the colour material be precipitated as a solid by means of a mordant, the solid material resulting is known as a *lake*, which, hence, usually consists of an organic colouring product united with a metallic salt. A large number of such pigments are known and commonly employed, as, *e.g.* *madder lake*; *alizarin red lake*, formed by mixing a caustic soda solution of alizarin red to a solution of alum with a little calcium chloride; *carmine lake*, *Dutch pink*, and *quercitron lake*, and an innumerable array obtained from the different so-called aniline dyes.

Lamaism, the religion of Tibet and Mongolia, is Buddhism (q.v.) disfigured by the introduction of elements derived from Sivaism and Shamanism. Its cardinal doctrine is that of "the three jewels," the first jewel being the Buddha, regarded as the most exalted of saints; to him is due the second jewel, the "doctrine" or moral law, the only form in which the Buddha exists since his absorption in the Nirvâna; the "priesthood jewel" consists of

the whole company of Buddhistic saints, whether incarnate or purely spiritual and disembodied, and therefore includes the higher Tibetan clergy. Below the saints rank the gods and spirits, including many derived from Sivaism, such as Indra, Yama, Yamântaka, and Vaisravana. The call to worship is heard three times daily, and, when the clergy have assembled, prayers are offered up and hymns are chanted amidst the most confusing din produced by a variety of musical instruments.

An essential element in Lamaism is the organisation of its hierarchy, in which numerous travellers, from the earliest Jesuit missionaries downwards, have observed a striking similarity to the Roman Catholic system. It owes its present form to the reformer, Tsong-Kapa, who lived in the 14th and early 15th centuries. At the head of the priesthood are the Dalai-lama and the Pantshen, in each of whom a leading disciple of Tsong-Kapa is continually reappearing in human shape. The Dalai-lama and the Pantshen are temporal as well as spiritual rulers, the former being the more powerful. There is also a lower clergy, divided into four orders; the members for the most part live in monasteries.

Lamarck, CHEVALIER DE (1744–1829), was born in Picardy and educated for the Church; he joined the army, however, where he became an officer. Owing to injuries he was obliged to leave and take up miscellaneous work, and in 1773 he began his scientific studies. In 1809 was published his *Philosophie Zoologique*, and from 1815–22 his *Histoire des Animaux sans Vertèbres*.

Lamartine, ALPHONSE MARIE LOUIS DE (1790–1869), was born at Macon; he held diplomatic posts in Italy till the accession of Louis Philippe. Defeated at the elections, he went for a two years' tour in the East, and returning in 1833, sat in the National Assembly until 1848. He became Minister for Foreign Affairs, but retired and took no further part in politics. His principal works were *Histoire des Girondins*, *Souvenirs d'Orient*, and *Histoire de la Restauration*.

Lamb, CHARLES, was born in 1775, in Crown Office Row, in the Temple, where his father was clerk and servant to one of the benchers, Mr. Salt. Mr. Salt, in time, procured for him an admission to Christ's Hospital, and so he became a blue-coat boy, and a friend for life of his school-fellow, Coleridge. On leaving school he took a clerkship at the South Sea House, but soon obtained a better position in the accountant's office at the India House. In 1796 the insanity which was in his father's family sent him for a few weeks to an asylum. He was never attacked again, but his elder sister, Mary, shortly after his recovery, in a fit of frenzy murdered their mother. He at once undertook the responsibility of her guardianship, and for the rest of his life devoted himself to her service, taking her to live with him on the death of their father in 1799. So serious a charge made a heavy demand on his purse, and he turned to literature to eke out his less than scanty income. In 1796 he published some sonnets among the *Poems* of Coleridge, and in 1798, in conjunction with his

friend Lloyd, a volume of verse, while in the same year he brought out a short romance, *A Tale of Rosamund Gray and Old Blind Margaret*. Always devoted to the theatre, he composed in 1799 a tragedy, *John Woodvil*, which he failed to bring out on the stage. His lack of success with this was followed by a cheerful undertaking of lower work. Between 1800 and 1803 he contributed facetious paragraphs to *The Morning Post* and other papers, rising early to compose his jokes before breakfast. In 1806 he again attempted a play, and wrote a farce, *Mr. H.*, which had actually a first night at Drury Lane, where it proved so complete a failure that Lamb himself contributed to the hisses amidst which the curtain fell. Success, however, was near. The *Tales from Shakespeare*, which he and Mary wrote together for Godwin's series of books for children, and published in 1807, obtained immediate and lasting popularity. In 1808 he gave a fine proof of his critical capacity in his *Specimens of English Dramatic Poets contemporary with Shakespeare*. A little later he wrote for *The Reflector*, unconsciously training his hand for his masterpiece, *The Essays of Elia*, which in 1820 he began to contribute to *The London Magazine*. The first series of these essays was published separately in 1823, the second two years afterwards. Their name was borrowed from an Italian who had been their author's fellow-clerk in the South Sea House thirty years before, and they were almost his last literary work, except some selections from old plays and his *Popular Fallacies*, published in 1828. In 1825 he retired from the India House on a pension, and two years later settled at Enfield. In 1833 he moved to Edmonton, his last home, where he died a few months after the death of his old friend Coleridge, on the 27th of December, 1834. Amidst the sadness of his devotion to his often-afflicted sister—which, perhaps, may excuse his one fault, indulgence in drink—he led an outwardly happy life, bringing merriment everywhere with the wit of his conversation and a ceaseless flow of puns. His essays, in their humour and pathos, their quaint and unforeseen turns, are the expression of the mind alike of a true humorist and a true critic.

Lambeth, a parish and parliamentary borough in Surrey, 3,942 acres in area, forming part of the south-west of London. It is connected with Westminster by a bridge 1,040 feet long. It contains Lambeth Palace, the official residence of the Archbishops of Canterbury since the 12th century, where there are valuable MSS. and portraits of the archbishops; and St. Thomas's Hospital. Lambeth is now famous for its potteries. By the third Reform Bill it was divided into North Lambeth, Kennington, Brixton, and Norwood, each division returning one member.

Lamellibranchiata, a class of Mollusca (q.v.), including those forms which have a bivalve shell, such as oysters, mussels, and cockles. The group is characterised by the absence of a distinct head, from which circumstance it is often known as the Lipocephala; by the presence in most cases of a muscular, more or less triangular, foot, with which the animals can burrow into the bottom of the sea,

pond, or river in which they live; by the complete absence of eyes and of a rasping tongue such as is found in the Glossophora (q.v.). It is divided according to the nature of the adductor muscles, which close the shell, into (1) the Isomya, which possesses two such muscles of about equal size, one anterior and one posterior—*e.g.* *Anodon*; (2) the Heteromya, where the anterior muscle is much the smaller; (3) the Monomya, in which the anterior muscle is wanting—*e.g.* the oyster (*Ostrea*). Some of the animals of this group are of considerable importance commercially, not only as articles of food—*e.g.* the oyster—but also in various other ways. Thus some produce pearls; the shell of others is used for making buttons and other articles. They are also interesting as being among the most ancient forms of life known, their fossil remains occurring from the Cambrian period onwards.

Lamellicornia, the division of beetles including those in which the antennæ or “horns” are broad and flat at the end. The cockchafers are familiar English representatives of the group.

Lamennais, FÉLICITÉ ROBERT DE (1782–1854), a French religious writer, born at St. Malo, and educated with his brother by their uncle, M. des Saudrais. In 1805 he and his brother retired to their estate at La Chesnaie. Here he read much, and became after a time a free-thinker. In 1808, however, his *Réflexions sur l'État de l'Église en France pendant le 18^{me} Siècle* was suppressed on account of its extreme Catholic views. Lamennais was in England during the Hundred Days, and soon after his return was ordained. Between 1821 and 1823 he attracted the attention of the religious world by the publication of his *Essais sur l'Indifférence en Matière de Religion*, which denounced toleration and attacked Gallicanism. In 1820 the author went to Rome, and is said to have been offered a cardinalate by Leo XII. He continued to produce works of an ultramontane character till the revolution of 1830, when a change in his views began to be apparent. He joined Lacordaire and Montalembert in conducting *L'Avenir*, a journal devoted to the cause of religious and political freedom, having for its motto “*Dieu et Liberté*.” Their views were condemned by Pope Gregory XVI., and in 1834 Lamennais announced his change of attitude towards the Papacy in his *Paroles d'un Croyant*. Its author now gradually became a free-thinker, and an active sympathiser with revolutionary ideas. In 1840 he was condemned to a year's imprisonment for a political pamphlet, and he was a member of the Constituent Assembly in 1848. In these later years he produced *Esquisses d'une Philosophie* and a translation of the *Divina Commedia*. His *Affaires de Rome*, published in 1837, and condemned by the Pope, gives an account of his journey to Rome in 1824 to defend his *Essais sur l'Indifférence*, which had offended even the orthodox.

Lamentations, the name of a canonical book of the Old Testament, afterwards extended into the “Lamentations of Jeremiah,” but now always used in the earlier and shorter form. The tradition that the book was written by Jeremiah is probably due to a note which precedes the Septuagint version;

it is not supported by internal evidence. Each of the first four dirges begins by describing the piteous state of Jerusalem, but finally expresses the writer's confidence that Jehovah will avenge the injuries inflicted on His people. The fifth and closing dirge, on the other hand, is a prayer entreating Jehovah to lay aside His long-continued wrath.

Lametrie, JULIEN OFFRAY DE (1709–54), a French materialist writer, was born at St. Malo. His father intended him for the Church, but he himself preferred medicine. As surgeon of the Gardes Françaises he was present at Dettingen and Fontenoy. In 1746 he produced his *L'Histoire Naturelle de l'Âme*, which he pretended was a translation from an English work. The way in which it was received compelled him to take refuge at Leyden, which he had to leave two years later in consequence of his *L'Homme Machine* and several satires on the medical faculty. He passed his last years at Berlin under the protection of Frederick the Great.

Lamia. [DEMONOLOGY.]

Lamination, the division of a rock into thin leaf-like layers, or *laminae*, having the same mineral composition and parallel, to the stratification. The structure is characteristic of shale, and, as most of the clayey rocks of great geological age are shaley, it may be in these cases due to the vertical pressure of superincumbent rocks. [CLEAVAGE, FOLIATION, SHALE.]

Lammas Day, August 1st, the feast of St. Peter ad Vincula (“in chains”). The name (Anglo-Saxon, “loaf-mass”) was probably given because the bread used at the mass was made of the new corn.

Lämmergeier, the German name of the Bearded Eagle, Vulture, or Griffin (*Gypaëtus barbatus*), the *Quebranta-huesos*, or Bone-smasher of the Spaniards, the largest bird of prey in the Old World. This eagle, with the habits of a vulture, ranges from the south-east of Europe and the north of Africa eastward to China. The length is from three to four feet, and the wing-spread from nine to ten feet. The plumage on the upper surface is brownish black, tawny beneath; the white head bears a black line on each side, and there is a tuft of black bristles at the base of the bill. It is a cowardly bird, feeding on small mammals and carrion; and stories, apparently well authenticated, are told of its carrying off young children.

Lamoricière, CHRISTOPHER LOUIS LÉON JUCHAULT DE (1806–65), French general, was a native of Nantes. Having entered the army in 1826, he served for many years in Algeria, and was largely instrumental in the capture of Abd-el-Kader in 1847. He had been elected a deputy of the French Assembly in the preceding year as a member of the constitutional opposition; and on the abdication of Louis Philippe he wished to proclaim the Duchess of Orleans regent. He did good service against the insurgents, and was made war-minister by Cavaignac. As an opponent of Louis Napoleon he was arrested on the night before the *coup d'état* of 1851, and was banished from France. In 1860 Pius IX. made him commander of the Papal troops, but he

was defeated by the Sardinians, and capitulated at Ancona on September 29th. He died at Amiens.

Lamp is a term somewhat loosely applied to various devices for artificially producing light or heat, but is more properly confined to those in which fluid fuel is burnt. A lamp consists essentially of a reservoir to contain the oil or spirit, a wick and wick-holder, and some means for ensuring an adequate supply of air to the flame. The lamp of the ancients was merely a shallow vessel, with a spout holding a solid round wick of fibrous material. This construction is retained in the case of spirit-lamps, but the supply of air is not sufficient for the complete burning of oil. An improvement was effected by the substitution of a flat for a round wick, as the flame was spread out and exposed more surface to the air. This flat wick was bent into a tube by Argand, who effected a further improvement by adding a chimney, which caused a current of air to impinge on the flame. This chimney was then contracted near the base of the flame, and a metal disc placed inside the flame, both of which deflected the air against it. Modern lamps have merely been improved in points of detail. Mineral oils (paraffin) are sufficiently limpid to rise in the wick by capillary attraction, but in the case of thick oils, such as colza, which were used until comparatively recently, some means must be provided to force the liquid up to the burner. The "Moderator" is the best of these: a piston, propelled by a spring, forces the oil upwards. In the "reading-lamp" the burner is about on a level with the bottom of the reservoir, the oil from which flows into the burner by gravity. Paraffin has practically superseded all other oils for burning. The cheaper forms of lamp have one flat wick, which, as in the case of almost all lamps, can be raised or lowered in a tube by means of toothed-wheels fitted on a spindle. A sheet-metal cap covers the wick-holder, and has an oval slit to direct the air-current against the flame. Better distribution of light is effected by having two wicks, as in duplex-lamps, and three or more wicks are used in lamps for optical lanterns. Several forms of tubular burners have been devised for paraffin-lamps, in some of which the air is supplied to the inner portion of the flame by a tube passing through the centre of the oil-container. The chief points to be considered in the design of a lamp are: the chimney must be long enough to produce a strong current of air, which must be directed against the flame by a contraction of the chimney, or by properly-placed pieces of sheet-metal; the oil-holder must be as far as possible prevented from becoming heated by arranging that the air shall circulate round those parts which would conduct the heat downwards from the flame. Blow-lamps produce a non-luminous flame of great heat by combustion of the vapour produced by heating alcohol or benzolene. This is allowed to escape through a fine jet, and in the best forms burns in a Bunsen burner.

Lampblack consists almost entirely of amorphous carbon in an extremely fine state of division. It is formed by burning an oil, or other highly carbonaceous material, in a limited supply of air, and

collecting the soot formed as a product of the incomplete combustion. It is very largely used as a pigment, and in the manufacture of printing and Indian inks.

Lamprey, the popular name for any vertebrate of the Cyclostome family Petromyzontidæ. [CYCLOSTOMATA, HAG.] The body is eel-shaped and naked, the skeleton cartilaginous, and there is a single nostril on the upper side of the head, and behind the head on each side are seven branchial pouches. The larvæ undergo a metamorphosis. Lampreys are widely distributed in the rivers and round the coasts of the north and south temperate zones. Little is known of their habits, but some ascend rivers to spawn, and in fresh water the young undergo their metamorphosis, which takes from three to four years to complete. They feed on dead aquatic animals, thus acting as scavengers, and on crustaceans, and attach themselves to fish by means of their suckorial mouth, eating into the flesh of their victims, who are unable to shake off their enemies. Dr. Günther records the fact that salmon have been taken in the Rhine with the Sea Lamprey attached to them. The type-genus *Petromyzon*, from the northern hemisphere, has two dorsal fins, the hinder one continuous with the caudal. There are three British species—the Sea Lamprey (*P. marinus*), about 3 feet long, from the coasts of Europe and North America; the River Lamprey (*P. fluviatilis*), about 2 feet long; and Lampern, Pride, or Sandpiper (*P. branchialis*), about half that size. The larva of the last-named form was long thought to be quite distinct, and was formerly placed in a separate genus. [AMMOCETE.] Its toothless mouth is fringed with barbules, the small eyes are hidden in a groove, and there is a single continuous vertical fin. Lampreys have long been esteemed for food, and G. A. Sala states that a large number of the "eel-pies" sold in London are made from Thames Lamperns.

Lampyrinæ. [GLOWWORMS.]

Lamuts, a branch of the Tungus people who occupy the banks of the Kolyma, the shores of the Sea of Okhotsk from the station of Okhotsk to Ghizighinsk Bay, and the west coast of Kamchatka. The Lamuts, who are reindeer nomads, are readily distinguished from the other Tunguses both by their ruder dialect and coarser features, more oblique eyes, more prominent cheek-bones, and extraordinarily small nose. Their camping-grounds are chiefly along the coast, whence their name from the Tungus word *lam* = "sea"; total population, a little over 3,000.

Lanarkshire, a lowland county of Scotland, having Stirling in the N., Dumfries on the S., the Lothians and Peebles on the E., and Renfrew and Ayr on the W. It has an area of 564,284 acres. The river Clyde cuts it into two nearly equal portions, and the Avon and other tributaries help to water it. In the S. are the Lowther or Lead Hills, from which the Clyde rises. Much of the soil is barren marshland, but the rest affords excellent pasturage, and from it abundant fruit crops are raised. The Clydesdale orchards have been famous

for centuries. Lanarkshire is rich in mineral products, coal, iron, and lead being obtained in great abundance. Some gold and silver is found. The chief towns are Glasgow, Airdrie, Hamilton, and Lanark, the last being an old place 31 miles S.E. of Glasgow, near which are the beautiful falls of Clyde. Lanark, Hamilton, and Airdrie are members of the parliamentary group of Falkirk boroughs. The county was given four new members by the Reform Bill of 1885, and has six in all.

Lancashire, the most populous county in England, though only the sixth in size, lies mainly between Yorkshire and the Irish Sea, but has Westmoreland on the N.E. and Cumberland on the N. A small part of it, called Furness, is separated from the rest by Westmoreland and Morecambe Bay. Lancashire is 76 miles long, and has a total area of 1,208,154 acres. The coast-line is much indented, Morecambe Bay and the mouths of the Ribble and Mersey being the largest inlets. The county is mountainous in the north and along a great part of the Yorkshire border. Conistone Old Man, near the Cumberland border, is 2,633 feet high. The Lune, the Mersey, and the Ribble are the chief rivers, with the Leven in Furness. The climate is mild, and the rainfall somewhat heavy. Oats and potatoes and some wheat are grown; but Lancashire is not an agricultural county; it has a large coalfield; and limestone, iron, lead, and other minerals are found. The chief industries are the cotton manufacture, the making of machinery, and shipbuilding. The most important towns are Liverpool, Manchester, Preston, Blackburn, Salford, Bolton, Wigan, Burnley, Bury, and Barrow-in-Furness. Lancaster is the old assize town. Lancashire was to return twenty-three county members by the Reform Bill of 1885. [LANCASTER, DUCHY OF.]

Lancaster. 1. The assize town of Lancashire, stands on the S. bank of the river Lune, 20 miles N. of Preston. The old castle is now used as the county gaol. The church of St. Mary dates from the 15th century, and contains some fine stained glass. In 1698 the town was almost destroyed by fire. Among its modern institutions are the Ripley Hospital for orphans and a public park. There is a dock at Glasson, five miles distant, where the larger vessels unload. Whewell and Richard Owen were natives of the town, which was disfranchised in 1867 for corrupt practices.

2. The chief town of Pennsylvania, 69 miles W. of Philadelphia, was founded in 1730, and was for some years the capital of the state. It has large tobacco warehouses, and numerous cotton mills, breweries, and tanneries. Among educational establishments are the Franklin and Marshal College and a theological college for members of the German Reformed Church.

Lancaster, DUCHY AND COUNTY PALATINE OF. The ancient honour of Lancaster was by Henry III. made into an earldom and given to his son Edmund. Edmund's grandson Henry was created a duke and earl palatine by Edward III. in 1351. In 1377 these titles passed to John of Gaunt, who had married Henry's daughter and heiress, and were by him handed on to his son,

Henry IV. After the attainder of Henry VI. the duchy was united to the Crown by Act of Parliament, the county palatine being incorporated in the duchy at the same time. This arrangement has been maintained up to the present time. The revenues of the duchy have always formed a distinct item in the royal revenue; they are paid over to the Privy Purse, and an annual account is presented to Parliament, but in other respects they are free from parliamentary control. The administration of justice was assimilated to that of the rest of England in 1873, and the office of Chancellor of the Duchy is now a political appointment with nominal duties, frequently held by a Cabinet Minister.

Lancaster, JOSEPH. [EDUCATION.]

Lancaster Gun, an obsolete heavy gun, the peculiarity of which consisted in the fact that the twist to the projectile was given, not by rifling, but by making the bore of the gun of oval instead of circular section.

Lance, a long spear, used for charging rather than throwing. It was much used in the Middle Ages, when it exceeded in length the modern lance by about five feet.

Lance, GEORGE (1802-64), the still-life painter, was a native of Little Easton, Essex. He was a pupil of Haydon for seven years, and exhibited between 1828 and 1862 both at the Royal Academy and the British Institution. He died at Sunnyside, near Birkenhead. Three of his pictures, two of which are fruit pieces, are in the National Gallery, and two fruit pieces and a portrait of himself (1830) at South Kensington.

Lanceolate, shaped like a little lance, a term applied to the form of leaves, in slightly differing senses by various writers. Some define it as narrowly elliptical, tapering to each end—widest, that is, across the middle. Others consider it more typically represented by a narrow leaf widest near the base and tapering upwards. Both forms occur in many willows.

Lancers, cavalry soldiers armed with lances. They were introduced into European armies by Napoleon I.

Lancewood, straight-grained, tough, light, and elastic wood used for straight carriage-shafts, bows, billiard-cues, fishing-rods, etc. It is imported from Jamaica and other West Indian islands and from Guiana, in taper poles 15 to 20 feet long and from 6 to 8 inches across at the butt-end. Jamaica exports about 8,000 poles annually, the value of which is about £2,820. Lancewood is the produce of several species belonging to the order *Anonaceæ*, the custard-apple family, including *Uraria lanceolata* in Jamaica and *Duguetia quitarensis* and *Guatteria virgata* in Guiana.

Lander, RICHARD (1804-34), an African explorer, was the son of a Truro innkeeper. In 1823 he went to the Cape of Good Hope as servant to Major Colebrook, and two years later joined Captain Clapperton's expedition to the Niger, of which he became leader on the death of Clapperton in 1827. Of this expedition he wrote an account. In 1829

he and his brother JOHN (1807-39) were sent by the Government to trace the river Niger. In 1831 they published results, giving some particulars of its lower course, and showing that it fell into the Gulf of Guinea. In the following year they also published their journal, and Richard started on a fresh expedition, the object of which was to open a Niger trade route. Having accomplished something, he received a mortal wound in a conflict with the natives.

Landes, a maritime department in the south-west of France, between the Garonne and the Pyrenees, having an area of 3,598 square miles. Its name is derived from the heaths which cover the greater part of its surface, but which extend also into the department of Gironde. Along the coast are lagoons, which communicate with the sea, intersected by sandy downs covered with pine-trees. The department is watered by the Adour and other rivers. It is thickly-populated, although much progress has been made since the last century in the reclamation of the soil. Sheep and pigs are kept, and much timber is cut from the extensive forests; while in the south the vine, rye, and maize are grown. There are also iron- and coal-mines. The department is divided into the *arrondissements* of Mont de Marsan (including the capital of the same name), Sever, and Dax, where there are mineral springs.

Landlord and Tenant. The relationship existing between the owner of a house or land and the person occupying the same in consideration of a certain rent, presents some points of interest. When not created by lease or by agreement varying the ordinary terms of a yearly tenancy, six months' notice to quit, expiring with date of the commencement of the tenancy, is required on either side to determine the contract. The landlord has the right of distress for recovery of his rent. The landlord impliedly ensures his tenants quiet possession and guarantees him against eviction by any person having a title paramount to that of the landlord. The rent may be received quarterly, monthly, or weekly. It is in all cases desirable for both parties to have a written agreement, though this is very much neglected, especially with small property. Where the tenant does not take upon himself the liability for repairs they have to be done by the landlord, and in cases of small tenements let by the month or week, the rates and taxes are usually paid by the landlord. There is no suspension of the liability to rent in case of fire, in the absence of any special agreement to that effect.

Landon, LETITIA ELIZABETH (1802-38), the well-known "L. E. L." was born in Chelsea. In 1815, when living at Brompton, she made the acquaintance of Sir W. Jerdan, the editor of the *Literary Gazette*, and became a frequent contributor of verse and reviews to that paper. Her verse soon became popular. *The Troubadour* and other poems appeared in 1825, and her first novel, *Romance and Reality*, in 1831. Her best work of fiction was *Ethel Churchill* (1837). *Traits and Trials of Early Life* was probably autobiographical. She married, in 1838, George Maclean, Governor of

Cape Coast Castle. Soon after her arrival in Africa she died, probably by her own hand.

Landor, WALTER SAVAGE (1775-1864), was born at Warwick. He distinguished himself at Rugby by his skill in writing Latin verse, but had to be removed for his intractable conduct. He showed the same qualities and defects at Oxford, and was rusticated by the authorities of Trinity College. He quarrelled also with his father and with his wife, whom he married immediately after meeting her at a ball in Bath. He adopted no profession, but lived on an allowance during his father's life. In 1798 he published *Gebir*, which was admired by Southey, Coleridge, and Shelley, but was little read. On the death of his father in 1805 Landor went to live at Bath. In 1808 he made the acquaintance of Southey, who became his life-long friend and warmest admirer. In the same year he served for some months in Spain against the French, and on his return joined in the denunciation of the Convention of Cintra. *Count Julian* was composed in the winter of 1810-11, and published by the help of Southey. The next few years were spent at Llanthony Priory, a place Landor had bought in Wales. Here he was unfortunate, and in 1814 had to go to Jersey. After a short time in France he went to live in Italy. In 1835, after another quarrel with his wife, he again came to England, where he remained till 1858, when he was driven away by an unpleasant libel action, in which heavy damages were given against him. He was now entirely dependent upon his family, and, after lingering for six years longer, died at Florence. His greatest work was undoubtedly in prose, *The Imaginary Conversations*, *Pericles and Aspasia*, and *The Pentameron*.

Landrail. [CORNCRAKE.]

Landseer, SIR EDWIN HENRY (1802-73), the great animal-painter, was born in London. He made sketches of animals before he was six years old, and also etched at an early age. In his twelfth year he gained the silver medal of the Society of Arts. In 1816 he entered the Royal Academy schools, and next year exhibited a portrait of a terrier. In 1820 he gained his first great success with his *Alpine Mastiff's reanimating a Dead Traveller*. In 1826 he was elected A.R.A., and in the following year exhibited his first great Highland picture. In 1831 he became an Academician, and in the same year exhibited at the British Institution his *High Life* and *Low Life*, now in the National Gallery. Between 1830 and 1840 were also painted his most popular dog-pictures, *Jack in Office*, *Old Shepherd's Chief Mourner*, *A Distinguished Member of the Humane Society*, and *Laying down the Law*. In 1850 he was knighted, in 1855 received the gold medal at the Paris Exhibition, and in 1859 began the lions in Trafalgar Square. He refused the presidency of the Royal Academy in 1865. For many years he suffered from great mental depression, and in 1868 was hurt in a railway accident. He was buried in St. Paul's.

Landslips, the detachment and slipping forward of masses of rock from the upper part of steep

slopes or cliffs. They may originate in the opening of an earthquake fissure, in the undermining of its bank by a river, or in the solution of beds of rock-salt by underground water; but the most general cause is the saturation of rock by exceptional rain aided in many cases by the inclination of the strata. The fatal landslide at Naini-Tal, in the Himalayas, was due to the slipping of a saturated mass of highly-inclined slates. Very frequently an underlying sandy layer is converted by the water into a running sand, whilst a bed of clay may be so lubricated as to facilitate the slipping under the influence of gravitation. Such a sandy layer underlay the highly-inclined sandstones and conglomerates in the Rossberg landslips of Goldau in 1806 and 1874, and the prehistoric slip which produced the Under-cliff of the Isle of Wight, and that of 1839 near Axmouth, were caused by water-laden Cretaceous rocks over a layer of porous Greensand and a mass of Gault or Lias clays. From its frequent action in this manner the Gault is known as the "blue slipper clay."

Landuman (LADUMA), a Negro people of Senegambia, Rio Nunez basin, nearly to the coast, from which they are separated by the Nalu and Baga tribes; formerly under the Fulah prince of Futa-Jallon, the Landumans are now French subjects, governed from the station of Boké, which has replaced the old post of Kakandy. They are fetishists of a low type, observing many gross and even atrocious rites; indolent and given to drink and revolting orgies; practising no arts except agriculture (rice, millet, ground-nuts); speech closely akin to that of the Jalonkes, which is a Mandingan dialect.

Landwehr ("LAND DEFENCE"), a corps in the armies of Germany and Austria, the members of which are liable to military service only in time of war. The Prussian Landwehr was originally organised by Scharnhorst in 1813. At present every German serves in the Landwehr for five years after completing his term of regular military service.

Lane, EDWARD WILLIAM (1801-76), the Arabic scholar, was born at Hereford, and educated there and at Bath. He learnt engraving under Charles Heath, but had to go abroad for his health. In 1825 he first went to Egypt, and next year ascended the Nile as far as the second cataract. In 1827 he went to Wady Halfa, and spent several days at Thebes. In the intervals of his travels he lived at Cairo, studying the language and people, whose dress he always wore. On his return to England in 1828 he brought with him in MS. his *Description of Egypt*, illustrated by more than 100 sepia drawings. It was enlarged after another visit to Egypt in 1833-35, and published in 1836 by Charles Knight under the title *Account of the Manners and Customs of the Modern Egyptians*. The work has been translated into German, and is still a standard authority. Between 1838 and 1840 Lane's translation of the *Arabian Nights* appeared in monthly parts. The notes to it were republished in 1883 under the title of *Arabian Society in the Middle Ages*. In 1842 Lane visited Egypt for the third

time, and remained there for seven years, during which he worked from twelve to fourteen hours a day at the composition of his *Arabian Lexicon*. Five volumes of it were published before his death, and it was completed in 1892 by S. Lane-Poole.

Lanfranc (d. 1089), Archbishop of Canterbury and chief minister of William the Conqueror, was born about 1005 at Pavia. He was well educated, and as a youth distinguished himself as a pleader in the courts. Preferring to devote himself to learning, he went to France, and set up a famous school at Avranches, in Normandy, in 1039. After some years he determined to become a monk, and entered the newly-founded monastery of Bec, of which he became Prior. Here he had Anselm and the future Pope Alexander II. among his scholars. He soon gained the favour and confidence of Duke William, whose marriage he at first opposed but afterwards advocated at Rome in person. In 1066 he left Bec for Caen. William consulted him about the invasion of England, and offered him in 1067 the archiepiscopal see of Rouen. In 1070 he accepted with some reluctance the Primacy of England, and next year received the pallium from his former pupil. Lanfranc worked in complete harmony with William I. He had a great contempt for the English, and always promoted the appointment of foreigners to sees and benefices. The part he played in obtaining the crown for William II. was important, and he stood by the new king against his old enemy Odo. Before his death, however, he lost much of his influence over Rufus. [WILLIAM I.]

Lanfrey, PIERRE (1828-77), French historian, was born at Chambéry. He studied law, but preferred literary work to practice. In 1858 he published an essay on the French Revolution, and in 1863 *Études et Portraits Politiques*, containing essays on Proudhon and Thiers' *History of the Consulate and Empire*. The first volume of his epoch-making *Histoire de Napoléon Ier* appeared in 1867, and the fifth in 1875, but the author only lived to carry it to the beginning of 1812. He served in the army during the German War, and, having afterwards entered the Assembly, was made by Thiers ambassador to Berlin in 1873. In 1875 he became senator. [NAPOLEON.]

Lang, ANDREW, critic and man of letters, was born in 1844. He was educated at St. Andrews and Balliol College, Oxford, and was elected a fellow of Merton in 1868. Besides doing an immense amount of journalistic work, he has devoted himself especially to scientific mythology, anthropology, and folk-lore. He has translated with Professor Butcher the *Odyssey* of Homer, and, with Messrs. Leaf and Myers, the *Iliad*; and has by himself produced fine renderings of Theocritus, of Perrault's *Fairy Tales*, and of *Aucassin et Nicolette*. He has also written several volumes of delicate original verse.

Langland, or LANGLEY, WILLIAM, the supposed author of *The Vision of Piers Plowman*, lived some time in the 14th century. Almost all that is known about him is in the notes to the MSS. of that work. Bale, a 16th-century writer, says he was a priest who was born at Cleobury Mortimer, in

Shropshire, that he was one of the first followers of Wyclif, and that his work was finished in 1369. Stow calls him John of Malvern, and there are references to the Malvern Hills in his work. We know from himself that he made his living by singing psalms and canticles, and that he spent most of his life in London, which he seems to have known well. Forty-five MSS. of *Piers Plowman* are in existence.

Langton, STEPHEN (d. 1228), a great English prelate and statesman, was born towards the end of the 12th century. He graduated in arts and theology in Paris, where he lived till 1206. In that year he was summoned to Rome by Innocent II. and created a cardinal. In the same year, when he was at the height of his reputation as a scholar, he was elected Archbishop of Canterbury, after two uncanonical elections had been quashed by the Pope. He was consecrated at Viterbo in 1207, but King John refused to acknowledge him, and proclaimed as his enemies all who should do so. The Pope in 1208 placed England under an interdict, and it was not till after a five years' struggle that Langton was allowed to act as Primate. During this time he lived chiefly at Pontigny, but in 1212 went to Rome to urge Innocent to take decisive steps to remedy the misery which existed in England. On his arrival in England Langton immediately took up a constitutional position. He mediated between John and the barons who refused to follow him to Poitou, and opposed the king and the legate when they appointed to vacant sees according to royal pleasure. In the eventful year 1215 he played an important part. He became one of John's sureties for the fulfilment of the charter of Henry I., mediated between the king and the barons when John's promises were not carried out, and brought to the king the articles afterwards embodied in the Great Charter. After the acceptance of the charter the Pope turned against the constitutionalists, and Langton went to Rome to remonstrate against their excommunication. He was suspended from his functions till the death of Innocent and the accession of Henry III. in England. In 1218 he returned to England, crowned the new king, and obtained from Honorius III. the promise that no Papal legate should come to England during his (Langton's) lifetime. In 1222 he presided over a very important Church council at Osney. His remaining years were occupied in obtaining confirmations of the charter from Henry III. and in securing the allegiance of the anarchical party among the barons.

Language. [PHILOLOGY.]

Languedoc, the name of an old French province, which is now divided into the departments of Aude, Tarn, Hérault, Lozère, Ardèche, and Gard, with several *arrondissements* in Haute-Garonne and Haute-Loire. Under the Romans it was known as Narbonensis Prima. It was granted by Honorius to the Goths, from whom it passed to the Saracens, till they were expelled by Charles Martel in 725. After belonging successively to the Counts of Toulouse and Philip the Bold of Burgundy, it became part of France in 1361. It was the land

of the troubadours and the Albigenses. *Langue d'oc* is the southern French dialect, as opposed to *langue d'oïl*, that of the north.

Laniidæ. [SHRIKE.]

Lanner. [FALCON.]

Lannes, JEAN, DUC DE MONTEBELLO (1769–1809), Napoleon's favourite marshal, was born at Lectoure. He entered the army in 1792, attached himself to Bonaparte in 1795, and greatly distinguished himself in his Italian campaigns. He also accompanied him to Egypt, and was with him at Marengo. From 1801 to 1804 Lannes was ambassador at Lisbon, after which he received a marshal's bâton and was ennobled. He afterwards served with distinction at Austerlitz, in the Prussian campaign, and in Spain, and was mortally wounded at Essling in the second Austrian War.

Lanoline. [CHOLESTERIN.]

Lansdowne [First Marquis, *see* SHELburne, EARL OF LANSDOWNE], HENRY PETTY FITZMAURICE (1780–1863), third Marquis, was born in London, and educated at Westminster and Cambridge. He entered Parliament as a Whig in 1802, and soon made his mark by his speech against Lord Melville's naval administration. In 1806 he (Henry Petty) was returned for Cambridge University, but in 1809 became a peer by the death of his elder brother. He was Chancellor of the Exchequer in Lord Grenville's Ministry, and in 1826 became Home Secretary under Canning. In the Goderich Ministry he was Foreign Secretary, and from 1831 till 1841 was President of the Council in Grey's Reform Ministry. After leading the Opposition to Peel's first Government in the House of Lords, he, in 1846, became Lord President under Lord John Russell. In 1852 he declined to become Prime Minister, but was a Cabinet Minister without portfolio in the Coalition Ministry and in the first Palmerston Administration.

Lansdowne, HENRY CHARLES PETTY FITZMAURICE, fifth Marquis, eldest son of the fourth Marquis, was born in 1845, and educated at Eton and Balliol. He was a Lord of the Treasury in Mr. Gladstone's first Ministry till 1872, when he became Under-Secretary for War. In 1880 he was appointed Under-Secretary for India, but resigned almost immediately because of his objection to the Liberal Irish policy. From 1883 to 1888 he was Governor-General of Canada, and was offered a seat in Lord Salisbury's second Cabinet. From 1888 to 1893 he was Governor-General of India.

Lantern Flies, a number of species of the genus *Fulgora*, including some of the largest of the Homoptera (q.v.). Some of the largest South American species are 3 inches long, but these are probably not luminous.

Lanthanum (LA)—atomic weight, 139—is a rare metallic element which occurs in *cerite* (q.v.) and some other rare allied minerals. The metal, which was discovered by Mosander in 1839, has a steel-grey colour, and oxidises if exposed to moist air. It possesses moderate ductility and malleability. It forms salts corresponding to the *oxide*

La_2O_3 , which is a white powder somewhat resembling lime.

Lanzarote, the most northerly of the Canary Islands (q.v.). It produces the finest wines; the capital is Arrecifa.

Lao, a main branch of the Tai race [TAI], closely related to the Siamese, but largely intermixed with Indo-Chinese aborigines, hence presenting a great diversity of types, are variously divided: first, into three groups—white, who do not tattoo; black and green, who paint the face in these colours; second, into white and black Paunches (Lau-pang-kah and Lau-pang-dun), the former in East Siam between Mount Deng-Phya-Phai and River Mekhong, the latter on River Menam above Bangkok, and thence to the Burmese frontier. These western Laotians are the same people as those collectively known as Shans, and ethnically the Lao, Shan, and Siamese are essentially one people, closely-related branches of the widespread Tai family. The Lao language is scarcely to be distinguished from the Siamese, except by its slower accentuation; it is little cultivated, and the writing system said to be peculiar to the Laotians is merely a modified form of the Cambodian, which is derived from the Pali introduced into Indo-China by the Buddhist missionaries from India. All the settled Laotians have long been Buddhists, governed by Siam either directly or through vassal native princes; but many have become French subjects (1893), now that the Mekhong has been chosen as the frontier between Siam and the French Indo-Chinese possessions. The so-called Lavas (Lawa, Lova) are pure or mixed Lao peoples, who have remained unaffected by Buddhist influences, and who are often scarcely to be distinguished from the surrounding wild tribes (Khas). They are, in fact, regarded as such by the civilised communities, who raid them periodically to keep up their supply of slaves, domestic slavery being still a universal institution amongst the Laotians. The Lao and Shan states and provinces have an area of not less than 160,000 square miles, with a total population vaguely estimated at from two to three millions.

Laocoön, according to the Greek legend, a brother of Anchises and a priest of Apollo. Having offended the god by his marriage, and also, perhaps, by the warning he gave to the Trojans about the wooden horse, he was destroyed with his two sons by two serpents while sacrificing to Poseidon. Virgil tells the story in the second book of the *Æneid*, and it has been preserved for posterity by the splendid sculpture now in the Vatican.

Laodicea (LAODIKEIA), the name of eight cities, so called by Seleucus, King of Syria, and his descendants from Laodicea, a frequent female name. Laodicea ad Lycum, in Phrygia, founded probably in the 3rd century B.C. by Antiochus II., and named after his wife, is one of the seven churches in the Revelation. Its site, now known as Eski Hissar, is deserted. It was a rich city, famous for its great medical school, for the wool which came from the sheep which were pastured in the neighbourhood, for its money transactions, and later for its coinage. Its ruin came when the Turks

invaded the Byzantine Empire. Two ecclesiastical councils (those of 363 and 476) were held here.

Laon, capital of the department of the Aisne, is 87 miles N.E. of Paris. It is rich in historical memories, the hills round it having been the scene of battles from the days of Julius Cæsar to those of Napoleon, who in 1814 tried in vain to dislodge Blücher from them. In September, 1870, a powder magazine was exploded at the moment when the Germans were taking possession. The see of Laon was founded by St. Remigius, and remained till the French Revolution. The first cathedral was destroyed in the communal disturbances of the 12th century, but was then replaced by a splendid building, part of which exists to the present day. Laon was one of the chief cities of the Franks, and in its fine library is an autograph of Lothair dated 972. The modern town is small and of little importance.

Lão-tsze, the reputed author of the *Táo Teh King*, one of the sacred books of China, lived probably in the 7th century before Christ, and was a historiographer in the state of Ch'ü, where is the modern province of Ho-nan. He was a contemporary of Confucius, whom he is thought to have met in 517 B.C. His real name was Li Erh, the designation by which he is generally known, meaning probably "the Venerable Philosopher." After writing his book at the request of Yin Hsi, the keeper of the gate leading into territories beyond those of Chün, he went away, and Ch'ien does not know when or where he died. The *Táo Teh King* is a short treatise, divided at first into two parts, but now subdivided into chapters. It seems that the quality which is inculcated in the book is single-minded action. The people were to be kept by their rulers without knowledge, so that they would wish to live only the life of the utmost simplicity. Táo "might appear to have been before God," says Lão-tsze. Humility, gentleness, and economy are its "three precious possessions," and good is to be returned for evil. Taoism at present is a system of polytheism, which borrowed from Buddhism its temples, liturgies, and forms of worship.

La Paz, the name of a department of Bolivia and its capital. The department, which joins Peru, has an area of 43,000 square miles, and contains the highest mountain of the Bolivian Andes. The town of La Paz de Ayacucho is one of the highest situated in the world, standing 11,970 feet above the sea-level. It is 40 miles E. of Lake Titicaca. Founded in 1548, it became a bishopric in 1605, in which year its cathedral, one of the finest in South America, was begun. A trade in copper and cinchona is carried on by its Indian and half-breed inhabitants. There is also a town called La Paz in the province of Entre Rios, Argentina.

Lapis Lazuli, a beautiful blue mineral consisting of a silicate of alumina, lime, and soda, with sulphides of iron and sodium. It usually occurs massive with an uneven fracture; but sometimes has dodecahedral cleavage or more rarely distinct crystalline form, belonging to the Cubic system. It is nearly opaque, with a vitreous lustre, a hardness

between 5 and 5.5, so that it takes a polish, and a density of about 2.4. With hydrochloric acid it forms a jelly of silica, and gives off sulphuretted hydrogen. It fuses, with intumescence, into a white glass. Veins of iron pyrites often occur in it, and ancient writers speak of it as the "sapphire sprinkled with gold." It occurs in crystalline limestone or gneiss in Persia, near Lake Baikal, in the Andes, and elsewhere, and was used for ornamental purposes in ancient Assyria and Egypt. It was long the sole source of the costly pigment *ultramarine*, for the preparation of which the lapis was ground, calcined, and levigated with water. Smalt-blue was often used instead of ultramarine; but now an artificial ultramarine, as good as the real, is prepared from clay, carbonate of soda, and sulphur at less than one-fiftieth of the cost.

Laplace, PIERRE SIMON, MARQUIS DE (1749–1827), the Newton of France, was a native of Beaumont-en-Auges, in Normandy. His abilities gained him the help of some neighbours of position, and at the age of eighteen he went to Paris with letters of introduction to D'Alembert. A letter to the *philosophe* on the principles of mechanics gained for Laplace his life-long support. The immediate result was an appointment as professor of mathematics at the École Militaire. In 1773 he read a paper before the Académie des Sciences, of which he became a full member in 1785, in which he demonstrated the invariability of planetary mean motions. He continued to investigate the subject, upon which also Lagrange was engaged, during the succeeding years, and in 1787 communicated to the Académie in two theorems his discovery of the cause of the inequalities of Jupiter and Saturn, and in relation to the former the "laws of Laplace." In the same year he showed the dependence of lunar acceleration upon the secular changes in the eccentricities of the earth's orbit. The *Mécanique Céleste*, which was further supplemented, and the *Exposition du Système du Monde* (1796), a note to one of the later editions of which contained the nebular hypothesis, formed Laplace's contributions to mathematical astronomy. In the department of pure mathematics he produced a *Théorie Analytique des Probabilités* (1812–20). Bonaparte made him Minister of the Interior, but was obliged to replace him by his own brother Lucien after six weeks, as he had no business capacity. He was soon, however, made a senator, and in 1803 became Chancellor of the Senate and a Grand Officer of the Legion of Honour. Although he had been made a count by the new emperor, he voted for his deposition in 1814, and was rewarded with a marquisate by the Bourbons in 1817. Ten years later he died at Arcueil.

Lapland, the country of the Lapps, is little more than a geographical expression. It lies between the White Sea on the E., the Gulf of Bothnia on the S., and the north-western coast of Norway on the W. That part which lies in Norway is mountainous; the rest consists of level forests, intersected by lakes and marshes. There are no towns of any size, and the country as a whole is very thinly peopled. In the greater part of it the sun does not set in midsummer or rise in midwinter.

The temperature in May, the hottest month, never rises higher than 70° Fahrenheit, and during the winter is frequently 60° below zero. Inara, the largest lake, has an area of 1,147 square miles, and the southern parts of Russian Lapland are watered by the Kemi and its branches. The lakes and rivers abound in salmon and other fish, and flocks of ptarmigan, capercailzie, and other wild-fowl are found about the shores of the Gulf of Bothnia. The forests yield an immense quantity of timber, and there are highly productive iron- and copper-mines. The sea fisheries give employment to thousands.

La Plata, the capital of Buenos Ayres, a province of the Argentine Republic, is some 30 miles S. of the town of Buenos Ayres. It is quite a new town, having been founded so recently as 1882. It has many fine modern buildings, and manufactures cotton and woollen tissues. Seven miles from the city are a hospital and an asylum. Its harbour is connected with that of Ensenada by means of a canal.

La Plata, RIO DE, the name given to the combined mouths of the Uruguay and Paraná rivers. It is about 200 miles long and 140 miles wide in the broadest part. There are wide sandbanks along the southern shore, and the only good harbour is that of Monte Video on the Uruguay coast. The water is remarkable for its muddy yellow colour. The Rio de la Plata was discovered by Diaz de Solis early in the 16th century; the discoverer was captured and eaten by cannibals.

Lapps, a main division of the Baltic Finns [FINNS], who are thinly spread over all the northern parts of Norway and Sweden, and north-west Russia (Kola Peninsula). The national name is *Same*, a dialectic variety of the Finnish *Suomi*, and occurring also in the national name of the kindred *Samoyedes*. But they are called Lapps (a word of unknown origin) by the Russians and Swedes, and *Finns* by the Norwegians, whence *Finmarken*, the name of the region occupied by them in Norway. According to their pursuits they are classed as Sea Lapps (fishers), Forest Lapps (hunters and trappers), Mountain Lapps (reindeer nomads), and River Lapps (husbandmen settled on a few riverine tracts). Since the last century all have been Christians—Lutherans in Sweden and Norway, "orthodox Greeks" in Russia—and most of them are educated sufficiently to read and write their own language (a member of the Finnish group), although little use is made of the accomplishment. The fundamental type is distinctly Mongolic—low stature (about 5 feet), highly brachycephalous (round) head, small slightly oblique black eyes, large mouth, small nose, long glossy black hair, broad flat features, yellowish complexion. The deviations from this type are due to contact with the surrounding Aryan (Teutonic and Slav) populations. Morally the Lapps are described as indolent and even lethargic, though subject to sudden fits of rage and religious excitement, cunning, spiteful, and of extremely coarse habits. They are not dying out, as is commonly supposed, and have even increased by 2,000 or 3,000 during the present century,

numbering at present about 26,000, of whom 16,000 are in Norway, 7,000 in Sweden, and 3,000 in Russia. The reindeer have also increased from about 100,000 head in the 17th century to over 400,000 in 1890. (E. Rae, *The Laplanders*, etc., 1875; A. H. Keane, *The Lapps*, 1885.)

Lapwing (*Vanellus vulgaris*), a common British bird, named from its habit of flapping its wings, and called Peewit, Peesweep, and in French *Dix-huit*, from its note. It belongs to the Plover family (*Charadriidæ*), and ranges eastward through Europe into Asia. The total length is about a foot. The head is crested. The dark plumage of the upper surface and breast bears a metallic gloss, and the under-surface is white. Lapwings frequent marsh and moorland, feeding on worms, molluscs, and insects. The flesh is valued for the table, and the eggs are often sold for those of the plover.

Laramie, a river of North America, rises near the North Park, Colorado, runs northward through Albany County, then eastward through a county in Wyoming which is called from it, and, after a course of some 200 miles, enters the Plata at Fort Laramie. The LARAMIE PLAINS are a fertile plateau sixty miles long in Albany and Carbon counties, Wyoming. They are enclosed on all sides by high mountains, and are themselves 7,500 feet above the sea-level. They are almost treeless, and afford rich pasture. The plains are bounded on the E. and N.E. by the Laramie Mountains, the highest peak of which is about 10,000 feet in height.

Larboard, in maritime parlance, the ancient name for what is now called "port," *i.e.* for the left-hand side of a ship viewed from the stern forward. The term was disused in consequence of its too great similarity with "starboard," which means exactly the opposite.

Larceny. [THEFT.]

Larch (*Larix*), the name of a small genus of firs, with soft, linear, deciduous leaves, generally borne in tufts (*fasciculate*) on dwarf shoots. The anthers dehisce transversely, and the pollen-grains are very large and globose. The cones are small, erect, ovate-obtuse, the scales being woody and persistent with unthickened but irregular margins. *L. europæa*, the common larch, is a native of the Alps and Carpathians, growing at altitudes of 3,000 to 6,000 feet. It was introduced into England in 1629, and into Scotland in 1725, since which date it has been extensively planted, as its quick-growing durable timber affords a rapid return for capital. Of late, however, the ravages of the larch-canker, a fungus known as *Peziza willkommii*, among our larch plantations have caused landowners to look for some species to replace it. Larch bark is used in tanning, and the tree also yields *Venice turpentine* and a sugary excretion known as *Briançon manna*. Other species are *L. pendula*, the Tamarack or Hackmatack of North America, and others confined to Oregon and Columbia, to the Cascade Mountains, to Japan, to the Kurile Islands, to Siberia and to the Eastern Himalaya respectively.

Lardner, DIONYSIUS (1793-1859), projector and editor of *Lardner's Encyclopædia*, was the

son of a Dublin solicitor. After a distinguished course at Trinity College, where he took the law degrees in 1827, he was ordained. In the year of his graduation, however, he removed to London, having been appointed to the chair of Natural Philosophy and Astronomy in London University. He then began the *Cyclopædia*, which was finished in 1849. He himself wrote the chief mathematical articles, and among the other contributors were Mackintosh, De Morgan, Thirlwall, John Forster, Tom Moore, and Sismondi. Between 1845 and 1849 he made large sums by lecturing in the United States; but from that year till his death lived in Paris. He is usually credited with the prediction that ocean steam navigation would be found impossible.

Lares, in the early religion of Rome, were spirits of ancestors buried within the family abode and worshipped by the household. *Lar* was probably an Etruscan word meaning "lord." There were other Lares, also tutelary, but of a more public character.

Laridæ. [GULL.]

Lark, any bird of the Passerine family *Alaudidæ*, with fifteen genera, containing 110 species, chiefly from Asia and Africa. The inner secondaries are considerably elongated, and about equal to the primaries; the hind claw considerably lengthened, and nearly straight, or very slightly curved, and the tarsi scutellated behind. The type-genus *Alauda*, with seventeen species, ranges over the Palearctic region, all Africa, India, and Ceylon. They are small birds, plain-coloured, or spotted and streaked, nesting on the ground, noted for their song as they rise aloft, and valued for the table. The Skylark (*A. arvensis*) is a common British bird, partially migratory, though very many remain during the winter. In the autumn great flocks come from the Continent to England, which serves in some sort as a starting-place for migration southwards. The general length is about seven inches, and of the female a little less. The plumage on the upper parts is brown of various shades; the throat and top of the breast pale wood-brown, with dark spots, and the lower parts are pale yellowish-brown, with a darker wash on the thighs and flanks. The feathers of the head, which are dark brown with a pale edging, form a crest. The skylark is a common cagebird, and its song has been celebrated by poets. *A. arborea*, the Woodlark, also British, is a much rarer bird; and *A. cristata*, the Crested Lark, and *Otocorys alpestris*, occasionally visit this country.

Larkspur (*Delphinium*), a considerable genus of ranunculaceous plants, natives of the North Temperate zone, many of which, both annuals and perennials, are cultivated in our gardens for the beauty of their flowers. They are acrid plants with erect stems, but slightly branched, palmately-cut leaves, and loose terminal racemes of flowers. There are five petaloid sepals, of which the posterior one is prolonged into the spur, which gives the popular name to the genus. The petals are reduced, two being within the spur; the stamens are indifferent;

and the carpels vary from one to five, each forming a follicle.

La Rochefoucauld, FRANÇOIS, DUC DE (1613-80), the great maxim-writer, was born in Paris, the descendant of a very old noble family. The family had large estates in Angoumois, and the father of the maxim-writer was made a Duke by Louis XIII. During the lifetime of the old Duke his son was known as Prince de Marsillac. Under this name he served in the wars, intrigued with Anne of Austria against Richelieu, and was banished to his estates for so doing, joined in the league against Gaston of Orleans, and took part in the first Fronde, in which he was badly wounded. During the second Fronde, in which he followed Condé, La Rochefoucauld was shot through the head in the battle of the Faubourg St.-Antoine (1652); and he now spent some years in retirement. In 1662 he disavowed the *Memoirs* published by the Elzevirs in his name. His *Maxims* (*Réflexions, ou Sentences et Maximes Morales*) appeared in 1665 anonymously, and their value was immediately recognised. The author returned to Court shortly before the death of Mazarin, and formed a friendship with Madame de la Fayette. His *Maxims* are both a literary and philosophical masterpiece. La Rochefoucauld's *Memoirs* have also great literary and historical value, but it was not till 1817 that anything like a genuine edition of them appeared.

Larochejacquelin. [LA VENDÉE.]

Larynx. The larynx is composed of a cartilaginous framework united together by ligaments, and contains the two vocal cords the vibration of which produces voice. The larynx is interposed between the trachea, into which it opens below,

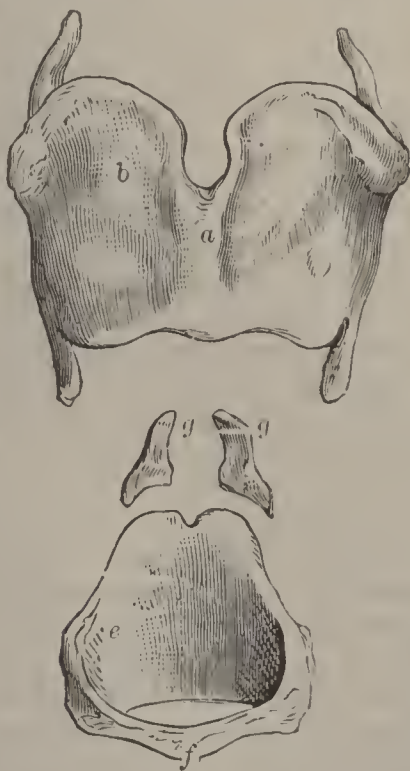


Fig. 1.—THE CARTILAGES OF THE LARYNX.

and the pharynx, into which it opens above. The superior aperture of the larynx is completely shut off from the pharynx, during the act of swallowing.

by the cartilaginous flap known as the epiglottis. The framework of the larynx is made up of the *thyroid* cartilage, which is composed of two lateral wings (*see* Fig. 1, *b*) uniting in front to form a prominent ridge (*see* Fig. 1, *a*), which is known as the *pomum Adami* or Adam's apple. Above and below on each side the thyroid cartilage has two projecting processes or horns; the two inferior processes articulate with the *cricoid* cartilage. This last-named cartilage is ring-shaped, its anterior portion (*see* Fig. 1, *f*) being much less deep than its posterior portion (*see* Fig. 1, *e*). Surmounting the upper border of the posterior portion of the cricoid cartilage are the two *arytenoid* cartilages (*see* Fig. 1, *g*). It should be observed that the figure does not depict the cartilages in their relative positions as they lie in the larynx: the thyroid cartilage has been as it were lifted up, so as to expose the hinder portion of the cricoid and the arytenoid cartilages (Fig. 1, *e g g*). To place the cartilages in correct position it is necessary to imagine the thyroid cartilage brought down until its two lower horns articulate with the lateral portions of the cricoid cartilage. The fifth cartilage of the larynx is the epiglottis, which is inserted upon the internal or hinder aspect of the thyroid cartilage just below the notch seen in the figure at the upper margin of the cartilage. Throughout the rest of its extent the epiglottis has no attachment, and serves as a kind of valve, which, when the larynx is raised in the act of deglutition, folds over and closes its superior aperture, thus preventing the food from gaining access to the respiratory passages. The vocal cords are two bands of elastic cartilage, which are attached in front to the thyroid cartilage below the point of attachment of the epiglottis, and are inserted behind into the arytenoid cartilages on either side. The slit-like aperture between the margin of the cords is called the glottis. The two points of attachment of the cords to the arytenoid cartilages can be approximated or separated from one another by the action of certain little muscles which rotate the arytenoid cartilages upon the underlying cricoid cartilage. In this manner the two vocal cords can be brought into close apposition, forming a narrow slit during the production of voice, while they are withdrawn from one another forming a much wider aperture, admitting of the free passage of air when ordinary breathing is going on.

The invention of the laryngoscope has enabled an exact study to be made of the appearance of the superior aperture of the larynx. In Fig. 2, *e* is the epiglottis; *a* marks the situation of the upper portions of the arytenoid cartilages, which are surmounted by two small masses of cartilage, the situation of which is marked by *s s*; *h p h* indicates the hinder wall of the pharynx; *u s b* indicates the true vocal cord of the left side; *o s b* is an overlying fold known as the false vocal cord. Between the true and false vocal cord is a kind of pocket known as the sinus or *rentricle* of the larynx (*see* Fig. 2, M. v.). The tension of the vocal cords is regulated by two little muscles which connect the cricoid and thyroid cartilages, the approximation of these two cartilages putting the cords on the stretch. The manner of production of different notes is not

understood. It presumably depends upon the extent of the cords which are put into vibration. In men the vocal cords are considerably longer than in women, in correspondence with the deep note of the voice of the former as compared with the higher note of the voice of the latter.

Diseases of the Larynx. *Laryngitis* is inflammation of the mucous membrane which lines the

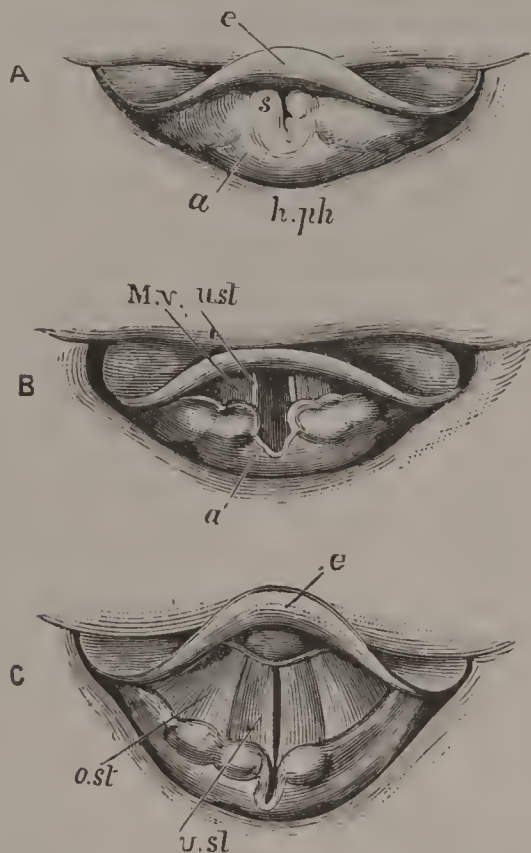


Fig. 2.—THE SUPERIOR APERTURE OF THE LARYNX.

- A. The aperture almost closed.
- B. The vocal cords separated during ordinary inspiration.
- C. The vocal cords in apposition during phonation.

larynx. The characteristic symptom is hoarseness or loss of voice, *dysphonia* as it is called. Where there is considerable swelling, there may be obstruction to the passage of air through the larynx and difficulty in breathing, *dyspnœa*. Acute laryngitis may be due to a chill or the action of irritant substances, or may occur in the course of chronic laryngitis. The larynx in children is unhappily not infrequently attacked in the course of diphtheria, and the false membrane which is then formed leads to serious obstruction to breathing and may necessitate the performance of an operation (tracheotomy or laryngotomy). Chronic laryngitis is usually accompanied by ulceration, and there may be considerable loss of substance. It is met with as the result of excessive use of the voice, and occurs in association with phthisis, syphilis, malignant disease, etc. Paralysis of the muscles which move the vocal cords is sometimes due to pressure upon the nerve (recurrent laryngeal) which supplies such muscles.

La Salle, ROBERT CAVELIER, SIEUR DE (1643–87), a great French explorer, was born at Rouen. He went to Canada in 1666, and some years later explored the country between Ohio and the lakes. Having obtained the support of the French Government, he descended the Mississippi, and at its mouth

set up the arms of France on April 9th, 1682. He then returned to Europe, but in 1684 was given soldiers and four ships in order to attack the Spanish power in Mexico, the ostensible object being to found a trade establishment at the mouth of the Mississippi. The expedition was unsuccessful; and, after two years' wandering about the borders of Texas, La Salle set out for Canada by way of the Mississippi. He seems, however, to have made himself unpopular by his harshness, and was assassinated by his followers near Trinity river.

Lascaris, CONSTANTINE, a great Greek scholar of the 15th century, was a descendant of the Emperors of Nicæa. On the fall of Constantinople he came to Italy, and became Greek tutor to the daughter of Francesco Sforza. In 1476 his *Greek Grammar* was published at Milan; it was the first Greek book printed. Lascaris afterwards taught at Rome and Naples, but died at Messina in 1493, having Pietro Bembo among his pupils. He left a collection of valuable MSS. to the Senate of Messina. Another member of this family, JOANNES LASCARIS, who was born about 1445, and died in 1535, was commissioned by Lorenzo de' Medici to collect Greek MSS., and was afterwards invited to France, where he was employed as a diplomatist by Charles VIII., Louis XII., and Francis I., and took part in the formation of the royal library at Fontainebleau.

Las Casas, BARTOLOMÉ DE (1474–1566), “the Apostle of the Indies,” was born at Seville. He graduated at Salamanca, but before his ordination in 1510 had been with Columbus to the West Indies, and lived in Hispaniola (Hayti) for several years. In 1511 he went to Cuba, where some years later he was given a “repartimiento” or allotment with Indians attached to it. Having been touched by the sufferings of the natives, he returned to Spain and induced Cardinal Ximenes to send a commission of inquiry to Hispaniola. He returned to Spain in 1517, and elaborated a scheme the main features of which were that Indian labour should be alleviated by emigrants from Spain and by the importation of African negroes. The scheme was a failure, and Las Casas soon bitterly regretted his slavery project. From 1522 to 1530 he retired to a Dominican convent in Hayti, and devoted himself to study. In the latter year he revisited Spain, and in the succeeding years travelled and preached in Mexico, Central America, and Peru. In 1537–38 he christianised the inhabitants of Tuzulutlan, the “Land of War.” Having declined the see of Cuzco, he accepted that of Chiapas, in Mexico, but, after administering it for three years, returned to Spain, disgusted by the failure of his efforts on behalf of the Indians. In 1550 he held a public disputation with Sepulveda at Valladolid, attacking with great eloquence the thesis maintained by him as to the lawfulness of carrying on unprovoked war against the Indians. His last years were crowned with success; for before his death at Madrid he had persuaded Philip II. not to approve the selling of the reversions of the “encomiendas” (by which the Indians would have been handed over to permanent

slavery), and had also obtained the restoration of the Guatemala courts of justice.

Las Cases. [NAPOLEON I.]

Laski, or À LASCO, JOHN (1499–1560), one of the reformers, was born in Poland. He was educated, with his brothers, by the Primate of Poland. He studied at Bologna, and in 1521 was ordained and made Dean of Gnesen. He stayed at Basle with Erasmus in 1524–25, and met some of the reformers there. On his return to Poland he received fresh benefices, and in 1538 became Archdeacon of Warsaw. In the same year he went to Frankfort, and thence to Mainz and the Netherlands. In 1542 he became pastor at Emden, where he set up a kind of Presbyterianism and met Hooper. In 1548 he arrived, by Cranmer's invitation, in England, and spent the winter at Lambeth. He was again in London in 1550, and became superintendent of the London church of foreign Protestants. He had great influence at the Court of Edward VI., and held extreme Protestant views. In 1553 he left England, and, after a short stay in Denmark, was again in Emden. His last years were spent in promoting the union of the reformed churches in Poland, and in helping to translate the Bible into Polish.

Lassalle, FERDINAND (1825–64), the founder of German social democracy, was born at Breslau of Jewish parentage. He refused to enter upon a commercial career like that of his father, and studied law, political economy, and history at Breslau and Berlin. In 1846 he took up the cause of the Countess Hatzfeldt, and, after eight years' litigation, succeeded in obtaining from her husband advantageous terms. In 1848 he was imprisoned for six months at Düsseldorf for the part he had taken in the revolutionary movement. Ten years later he came to live in Berlin. In 1861 he laid the foundation of his social and political system by his *System of Acquired Rights*. Lassalle's *Arbeiterprogramm*, or Labour Programme, called for a revolution against the capitalist system for the advantage of the large body of workers. There was no appeal to violence, but Lassalle was, nevertheless, prosecuted on this charge and, in spite of an eloquent defence, sentenced to four months' imprisonment. After his release he immediately set to work to show that German Liberalism was incapable of finding a solution for the political and economical situation, and to realise the aims of social democracy he founded in May, 1863, at Leipzig, the Universal German Working Men's Association, whose programme was universal suffrage and reform of the financial system. Having in vain tried to convert Berlin to his views, he now undertook a second campaign in the Rhine country, after the labours of which he sought rest in Switzerland. Here he met Helene von Dönniges, and a passionate attachment sprang up between them. The lady, however, was betrothed to a Roumanian nobleman, the Count Racowitza, whom she was compelled by her relations to marry. Lassalle, on receiving from her a letter of dismissal, challenged her father and the Count, and fell in a duel by the hand of the latter near Geneva.

Lassi, the dominant people of the province of Las, Baluchistan, to which they give their name, claim descent from a legendary Samar, founder of Samarkand, whose son Nerpat was the father of the Numri, of whom the Lassi are a branch. All, however, speak a language closely related to the Neo-Sanskritic dialect of Sindh (Lower Indus), and the features are distinctly of Rajput (Aryan) type. Four main divisions: Jokhyas, Jadgâls, Jets, and Numri (Lumri) proper.

Latakia, a port in Syria, 75 miles N. of Tripoli, on the site of the ancient Laodicea ad Mare. It has remains of Roman buildings, and was a wealthy city until far into the Middle Ages. The well-known Latakia tobacco is grown on the hills in the neighbourhood.

Latent Heat. When raised to a sufficiently high temperature many solids can be converted into liquids. During the transition the temperature (which is styled the melting- or freezing-point) remains constant, provided the pressure is unaltered, but heat is absorbed by the body. This heat, which produces change of state, and not rise of temperature, is known as the latent heat of fusion, and is generally defined as the amount of heat required to change one gramme of the solid substance into its liquid form. A similar absorption of heat without rise of temperature takes place at the boiling-point, when a liquid is converted into its vapour. This is called the latent heat of vaporisation, and is defined in similar units. The latent heat of water is 79, and of steam is 536, that number of C.G.S. units of heat being required to convert one gramme of ice into water, or water into steam. This heat is given out again when the process is reversed—*i.e.* the vapour liquefied or the liquid frozen.

Lateran, ST. JOHN OF (SAN GIOVANNI LATERANO), one of the chief Roman basilicas (q.v.), was built by Constantine about 333 on the site of a palace belonging to Plautius Lateranus, who was executed by Nero. It was completely altered by Sixtus V. (1586), who erected the present structure from designs by Fontana. The five œcumenical councils called Lateran (1123, 1139, 1179, 1215, 1518) received their name from being held in the church.

Latex, a milky emulsion occurring in special secretive structures in many plants. It is generally white, and its abundance gives the name *Lactarius* to a genus of fungi allied to the agarics. In *Chelidonium* it is orange, and among Dicotyledons its abundance is characteristic of the orders Moraceæ, Euphorbiaceæ, Sapotaceæ, and Papaveraceæ, and the sub-order Ligulifloræ of the Compositæ (q.v.). It occurs either in rows of small cells, as in the elder; in cells which grow to a large size and branch with the growth of the plant from the seed stage, as in some Euphorbiaceæ; or in a system of branching and anastomosing *laticiferous vessels*. These are generally in the bast region of the stem; but may also be in the young wood or pith. The fluid is mainly water with alkaloid in solution, and solid particles of rubber and albuminoid matter in suspension. In physiology (q.v.) its function appears

to be the conveyance of the "elaborated sap" from the leaves. Gutta, rubbers, and many medicinally valuable alkaloids are among the products of the latex.

Latham, ROBERT GORDON (1812-88), ethnologist and philologist, was born at Billingborough, Lincolnshire, of which his father was vicar. He was educated at Eton and King's College, Cambridge, and studied philology at Copenhagen and Christiania. In 1839 he became Professor of English in University College, London, at whose university he afterwards took the degree of M.D. His chief philological works were *The English Language* (1841), a new edition of *Johnson's Dictionary* (1870), and *Outlines of General Philology* (1878). In ethnology he produced *The Natural History of the Varieties of Mankind* (1850), *The Ethnology of Europe*, and several other works. He was the first who refused to accept the Central Asian origin of the Aryans.

Latimer, HUGH, the martyr, was born, probably about 1485, at Thurcaston, Leicestershire, where his father was a yeoman-farmer. He was well brought up, and taught archery amongst other things. In 1506 he went to Cambridge, and four years later was elected fellow of Clare Hall. Some years later he took orders, and in 1522 was licensed by the university to preach in any part of England. As early as 1525, however, he declared that he could not refute Luther's doctrines, and had to disown them. In December, 1529, he preached his two sermons *On the Card* in St. Edward's church, Cambridge. They excited a controversy which had to be silenced by royal command. His support of the king's divorce and the favour of Anne Boleyn stood him in good stead in the succeeding years. Early in 1531 he was instituted to the vicarage of West Kington, in Wiltshire. In 1532, however, he was inhibited from preaching in the diocese of London; but the influence of Cromwell and Anne Boleyn was strong, and, after having been one of the Lent preachers before the king in 1534, Latimer was appointed Bishop of Worcester in the summer of 1535. In a sermon before Convocation he also denounced purgatory and images, and he now began to be looked upon as one of the leading reformers. He was a regular attendant in Parliament in the session of 1539, but on the passing of the Six Articles resigned his bishopric. He also attempted to leave England, but was detained in the house of the Bishop of Chichester. On his liberation he was ordered to desist from preaching and not to visit the universities or his old diocese. In 1546 he was committed to the Tower on the charge of encouraging a reforming preacher named Crome, who was his friend. On the accession of Edward VI. he was released, and preached in 1548 four celebrated sermons at Paul's Cross, besides several in the King's Garden at Westminster. Soon after the accession of Mary he was summoned to London, but every opportunity was given him to escape. He refused to fly, and was committed to the Tower. In 1555 he suffered with Ridley, and died without much pain, uttering words which are now historical.

Latitude. In astronomy an imaginary great circle is drawn through a star and the pole of the ecliptic. The distance along this circle between the star and the ecliptic is its celestial latitude, and the distance along the ecliptic from the first point of Aries to the point where the same great circle cuts the ecliptic is its celestial longitude. These two measurements define the position of any celestial body.

Latitudinarians (Latin *latitudo*, "breadth"), a school of English theologians who in the 17th century sought to introduce a more liberal spirit into the Anglican Church. One of the chief aims of such men as John Hales and William Chillingworth was the union of all Christians, excepting Roman Catholics, into one communion, and to this end they endeavoured to minimise the importance attached to particular doctrines and ceremonies. In its later phases Latitudinarianism was represented by the "Cambridge Platonists," of whom Henry More was the most prominent, who laid stress on the intellectual element in religion, and sought to bring it into harmony with the teaching of the Platonic philosophy.

Latour d'Auvergne (1743-1800), THÉOPHILE MALO CORRET DE, a celebrated French soldier, called "Le premier grenadier de France," was born at Carhaix, Finistère. Having entered the army in 1767, he was present as a volunteer in the defence of Port Mahon against the English in 1781, and performed several exploits in the Spanish service. In 1789 he had attained the rank of captain, and he refused any further promotion. He served with the revolutionary armies in Spain, and was captured by an English cruiser in 1795. Released in 1797, he distinguished himself with the army under Moreau till his death at Oberhausen, in Bavaria.

Lattice-leaf (*Ouvirandra fenestralis*), a singular aquatic plant, growing in shallow water on the margins of running streams in Madagascar. The plant has fleshy farinaceous roots, which are used as food, and derives its popular name from the perforated condition of its oblong submerged leaves, which have hardly any mesophyll tissue within the meshes formed by the parallel longitudinal veins and the finer transverse ones. It belongs to the pondweed family (*Juncaginaceæ*).

Latude, HENRI MASERO DE (1725-1805), the celebrated prisoner, was born near Montagnac, Languedoc. In 1748, when he had come to Paris to complete his education in mathematics, he had an interview with Madame de Pompadour at Versailles, and warned her of the speedy arrival of a box of explosives through the post. When it was discovered that the contents were harmless, and that the whole thing was the stratagem of a young man to push his fortune, Latude was sent to the Bastille. After escaping from the donjon of Vincennes, whither he had been removed, he gave himself up, and remained in the Bastille for twenty-seven years, till 1777. His ingenious attempts to escape are related by Thierry. Soon after his release he came again to Paris, contrary

to express orders, and was again confined for seven years. He demanded and obtained compensation in 1793.

Latuka, a Negroid people of the Upper Nile basin, who occupy the uplands between the White Nile and the Sobat. Both in type and speech they have much in common with the Hamitic Gallas, and may be regarded as of mixed Galla and Negro descent. Morally also they differ greatly from the neighbouring Nilotic Negroes, being much more energetic, resolute, and brave; and, but for their incessant tribal feuds, the Latukas could not fail to become the dominant people in the Upper Nile region. Although wearing scarcely any clothes, they expend infinite labour on their hair, building it up in the form of a helmet and other fantastic shapes, which it takes eight or ten years to bring to perfection. Like their Bari neighbours, the Latukas show great skill in smelting and working iron, which is widely diffused throughout their territory.

Laud, WILLIAM (1573-1645), Archbishop of Canterbury, was the son of a Reading clothier. In 1589 he matriculated at St. John's College, Oxford, of which he became fellow in 1593. In 1601 he was ordained, and two years later was one of two Proctors of the university. In 1607 he obtained the vicarage of Stanford, Northants, and in the following year became Doctor of Divinity. After holding for a short time a living in Kent, he returned to Oxford in 1611 as president of his old college, and strongly opposed the Puritan party in the university. He became successively chaplain to the king, Archdeacon of Huntingdon, and Dean of Gloucester, and was appointed in 1621 Bishop of St. Davids. He was now intimate with the Duke of Buckingham. The accession of Charles I. greatly increased his influence, and, in spite of attacks made upon him in the House of Commons, he was promoted to the Bishopric of London in 1628. Two years later he became Chancellor of Oxford, in whose university and in the metropolitan diocese he began to impose silence on Puritan preachers and in other ways to carry out the king's views. In 1633 he was appointed Primate, and thenceforth worked to carry out uniformity and the due observance of ritual. At the same time he resisted the Romanising influences of the Queen's coterie. It was Laud who persuaded the king to force on the Scots the English Liturgy rather than that prepared by their own bishops; and he supported Strafford in his Scottish, as in other branches of his policy. On December 18, 1640, articles of impeachment were by an unanimous vote carried against him, and he was sent to the Tower in the following February. Here he had to wait for two and a half years before he was tried. In November, 1643, he was charged with endeavouring to subvert the laws and overthrow the Protestant religion; and though the judges, when consulted, declared that these charges did not strictly amount to treason, the Presbyterians obtained his condemnation to death by an ordinance of both Houses. He was executed in 1645.

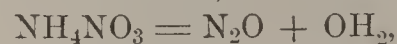
Laudanum is the term applied to a tincture of opium (q.v.), *i.e.* a liquid extract of this drug by

means of alcohol. The word was formerly used for various preparations, but is now restricted to the above tincture. It is very largely employed as an opiate and anodyne, being the most general form of opium extract. It has a brownish-red colour and characteristic odour, with a peculiar woody taste.

Lauderdale, JOHN MAITLAND, DUKE OF (1616-82), a Scottish administrator who gained for himself much odium among the Scottish Covenanters as the Viceroy of Charles II. He succeeded to the title of Earl of Lauderdale in 1645, and in 1657 was made prisoner at Worcester, and suffered nine years' imprisonment. At the Restoration he was made Secretary of State in Scotland, and used all his influence to advance the power of the Crown. He was in high favour with the king, was made Privy Councillor, and was a member of the famous Cabal, and was created Duke in 1672. An attempt to pass censure upon him was made in the House of Commons in 1678, but without success. He died at Tunbridge Wells. His private life conformed to the general type of the period.

Lauenburg, a district of the Prussian province of Schleswig-Holstein, situated on the right bank of the Elbe, between Hamburg, Holstein, and Mecklenburg. It was once a separate duchy, and came finally into the power of Prussia in 1865. Inhabited in early times by a tribe of Slavs, it came later into the possession of Saxony, and in 1705 it formed part of George I.'s Hanoverian Electorate. In 1815 it was made over to Prussia, who ceded it to Denmark, to resume it later. The surface, of 453 square miles, is generally flat, with some irregularities, and the soil, partly sandy partly alluvial, is well cultivated. There are lakes and forests, and the Stecknitz Canal connects the Elbe with the Trave, and it is on the railway from Hamburg to Berlin. Cattle-breeding is carried on, and the chief productions are timber, fruit, hemp, grain, flax, and vegetables. The town of Lauenburg is on the Elbe, but the present capital is Ratzeburg.

Laughing Gas. The gas known as laughing gas, owing to the slight and temporary form of intoxication which its inhalation first produces, consists of an oxide of nitrogen, nitrogen monoxide, N₂O. The further inhalation, however, soon produces insensibility, and the gas is hence used largely as an anæsthetic. It may be prepared by heating ammonium nitrate,



when it is obtained as a colourless gas slightly soluble in water, and condensable by cold or pressure to a colourless liquid. If used for medicinal purposes care must be taken to purify it from other oxides of nitrogen, which is accomplished by passing it through solutions of (1) potash, (2) ferrous sulphate. [NITROGEN.]

Laughing Jackass. [KINGFISHER.]

Launce, called also SAND LAUNCE and SAND EEL, any fish of the Anacanthinous genus Ammodytes. They are slender and eel-like, with the dorsal

fin running nearly the whole length of the back, and frequent sandy coasts on both sides of the North Atlantic.

Launceston. 1. An inland municipal and market town of Cornwall, almost on the border of Devon, and 50 miles W. of Exeter, is on a height near the Kinsey, a feeder of the Tamar. Originally Llanstephen, it belonged to the Earls of Cornwall from the time of the Conquest, and was till 1838 a county assize town. The trade is chiefly in agricultural produce. The 16th-century church of St. Mary Magdalen is notable for its carved blocks of granite and its detached tower dating from the 14th century. There are also remains of an old castle, seat of the Earls of Cornwall, besieged in the Civil War, and the scene of the Quaker Fox's imprisonment. The old grammar school of Edward VI. was rebuilt in 1862.

2. The second town (and since 1889 city) of Tasmania, forming the principal port of entry to the island on the north, and having steam connection with Melbourne and Sydney, and connected also with the former by submarine telegraph. There is a railway of about 130 miles to Hobart. The city is at the junction of the North and South Esk to form the Tamar. Besides the church (1824) there is a Government House, a post-office, a theatre, a hospital, a town hall, a library, and a large convent.

Launch, a peculiar kind of long-boat. Steam-launches are the largest steamboats supplied to ships of H.M. Navy. They are 42 feet long, and weigh with engines and boiler from 148 cwt. to 155 cwt. Their indicated horse-power is about 35, and their speed generally about 8 knots.

Launching, the placing in the water of a ship that has been built upon a slip. She is supported upon a strong timber cradle, which rests upon inclined "ways" that have been carefully greased. The whole weight of the ship is brought gradually to bear upon this cradle, and then, at the desired moment, the retaining "dog-shores" are knocked away, and the cradle, with the vessel on it, slips into the water. Vessels weighing at the time as much as 7,500 tons have been successfully launched in Great Britain. At the launch of a man-of-war it is customary for a bottle of wine to be broken on her bows when her name is given to her, for a short religious service to be read, and for the Union Jack, Admiralty flag, royal standard, navy flag, and white ensign to be displayed in the order named from flagstaffs specially erected for that purpose in the ship.

Lauraceæ, a natural order of dicotyledonous trees, comprising some 400 or 500 species in about fifty genera, mostly tropical and aromatic. They have exstipulate leaves dotted with oil-glands; inconspicuous flowers with eight to twelve stamens, the anthers of which open by recurved valves; and a superior ovary giving rise to a one-chambered, one-seeded drupaceous fruit. Among the chief members of the order are *Laurus nobilis*, the bay; *Nectandra*, the greenheart; the avocado pear, the

camphor-laurel, the cassia, the cinnamon, and the sassafras, which are mentioned separately.

Laureate, Poet. Amongst all the races of Western Europe minstrels appear to have been included in the retinue of royal persons from the earliest period of which there is any record. This was the case in England as elsewhere, but the term "poet laureate" was not used to denote an officer of the royal household receiving a fixed salary until the reign of James I. The laurel wreath was a recognised badge of the poet, especially if he had actually received it as a mark of distinction from some university; and during the Middle Ages the term "laureate" was frequently used both in the looser and in the more exact sense. In 1616 the title was conferred upon Ben Jonson, with a salary of 100 marks, which in 1630 was increased to £100, with the addition of an annual terce of canary. The latter was commuted for £27 at the end of the 18th century. The list of poets laureate includes Dryden (1670-89), Southey (1813-43), Wordsworth (1843-50), and Tennyson (1850-92), besides several poets of the second and third rank.

Laurel, the popular name for a variety of ever-green shrubs. The Alexandrian laurel is *Ruscus racemosus*; the Bay laurel, Poet's laurel or Roman laurel, *Laurus nobilis*; the Japan or spotted laurel, *Aucuba japonica*; and the Portugal laurel, *Cerasus lusitanica*; but now the name is most commonly applied in England to the cherry laurel, *Cerasus laurocerasus*. This shrub, introduced from the Levant in the 16th century, agrees with the cherry (q.v.) and differs from the plum (q.v.) in having its leaves conduplicate, or folded in the bud down the midrib, and in having a polished fruit without bloom. The leaves are elliptic-lanceolate, and of a bright, shining green; the small white flowers are in terminal racemes; and the drupes are black with smooth stones. The leaves, bark, and kernels yield a volatile oil containing cyanogen, in which some prussic acid is generally formed. This renders the use of the leaves in flavouring custards, as a substitute for bay-leaves, most dangerous. The leaves, when crushed, are used by entomologists to poison butterflies and moths.

Laurentian Rocks, the lowest series of Archæan rocks in North America, named by Sir William Logan from their development along the shores of the St. Lawrence, where they cover an enormous area. They are at least 30,000 feet thick, but their base is unknown. Logan divided them into two series—the *Lower*, over 20,000 feet thick, of granitoid gneiss, quartzite, and crystalline schists, with iron-ore and limestone; and the *Upper*, said to rest unconformably on the lower, 10,000 feet thick, of gneiss with much Labradorite (q.v.), as well as schist, iron-ore and limestone. The succeeding Huronian (q.v.) is said to rest unconformably on the Upper Laurentian. In the Lower Laurentian occurs the structure known as *Eöزون* (q.v.), once thought to be of animal origin. Archæan rocks of a similar lithological character to those of Canada, such as the Hebridean gneiss of the Highlands, were formerly termed Laurentian.

Laurustinus, or LAURESTINE (*Viburnum tinus*), a favourite evergreen shrub, native to the Mediterranean region, forming large woods in Corsica, but quite hardy in Britain. Its oblong leaves are a dark green; but its small corymbose cymes of white flowers with pink stalks are attractive at a very early season of the year. Its berries are a dark blue. The genus to which it belongs is that of the Guelder-rose.

Lausanne, a Swiss city, capital of the canton of Vaud, is on the S. slope of the Jura mountains, and near the N. shore of the Lake of Geneva—a railway connecting it with the village of Ouchy, which is the harbour and enjoys a considerable trade. The valley of the Flon divides the city into two parts, and is crossed by a bridge 617 feet long and 80 feet high. The 13th-century cathedral of



LAUSANNE.

(From a Photograph by Frith and Co.)

Notre Dame is interesting as the scene of Calvin's disputation in 1536. There are two museums, a large corn-market, an academy, and many educational institutions which attract many visitors. Here Gibbon is said to have written much of his work on Roman history, and at Ouchy Byron wrote *The Prisoner of Chillon*.

Lauzun, ANTOINE NOMPARE DE CAUMONT, DUC DE (1633–1723), favourite of Louis XIV., served under James II. in Ireland in 1689, was imprisoned in the Bastille, and is said to have secretly married the Duchesse de Montpensier.

Lava. [LAO.]

Lava, a general term for all those rocks which flow in a molten condition from volcanoes (q.v.). They differ very much in the extent to which they are saturated with steam and other gases, and also in composition, texture, density, and colour. Some are *acid*, containing 60 to 80 per cent. of silica, often pale buff in colour, and with a specific gravity between 2.3 and 2.7. Such are the liparites, trachytes, obsidian, pitchstone, and most pumice. Others, such as the basalts, are *basic*, with 45 to 50

per cent. of silica, much oxide of iron and such minerals as augite and olivine, and a density between 2.7 and 3.3. These are mostly dark grey or black, though the iron rusts on exposure. Lavas may be entirely *glassy*, as are obsidian and pitchstone; *vesicular*, like pumice; *semi-crystalline*, as in the bulk of volcanic rock; or even wholly *crystalline*, as are some liparites and basalts. The expansion of the contained vapours causes the lava to rise in the crater; and, though it may reach the rim and overflow it, its great density, exerting a pressure of about 120 lbs. per square inch, or 7 or 8 tons per square foot, for each 100 feet of the height of the column, generally forces it out as *reins* and *dykes*, fissuring the sides of the cone, and even rising sometimes in a fountain of molten rock. It glows with a white heat, being at first considerably more than 2,000° Fahr., steam and other vapours (especially that of salt) escaping from it at jets, known as *fumaroles*, and long hanging over it as a cloud. The motion of the stream has been compared to that of honey; but its rate varies not only with the slope and with the volume of the stream, but also with its fluidity. A stream from Vesuvius in 1805 travelled nearly four miles in four minutes, and one from Mauna Loa, in 1852, fifteen miles in two hours. It cools from white to red, and from red to black, with a slaggy, cindery surface, widening out at the foot of a slope and ending in a slowly-advancing wall like a mound of clinkers. A lava-flow may be many years before it has completely cooled; but, contrary to the opinion once held, it may consolidate on a surface inclined 35° or even 40°. In volume, the largest recorded outpouring was that of Skaptar Jökull, in Iceland, in 1783, when two streams flowed forty miles and fifty miles respectively, in opposite directions, with a width of from twelve miles to fifteen miles and a depth of 100 feet, deepening in river-gorges to 600 feet. The upper part of the lava-stream is generally pumiceous and glassy; but even in obsidian there are small crystals, and the bulk of the flow in consolidating has usually become at least semi-crystalline or micro-crystalline.

Laval, capital of the French department of Mayenne, the old town being situated upon the right bank of the river Mayenne and the new town on the left bank. The river is crossed by a 16th-century bridge, a good stone bridge, and a railway viaduct, and has steam communication with Angers. The town, which is 46 miles E. of Rennes, and 180 miles W. of Paris, received an influx of Flemish weavers in the 14th century, and is still a great centre of linen and ticking manufacture. There are also foundries, tanneries, paper- and dye-works, and flour-mills; and marble for lime-making is quarried in the neighbourhood. Besides a large cloth hall, other interesting buildings are a church of the 12th century, an old castle (now a prison) a museum and library, and some remains of ancient fortification.

La Vallière, LOUISE FRANÇOISE DE (1644–1710), a mistress of Louis XIV., was born at Tours of an old noble family. Her mother, marrying again, brought her to Court, where she attracted the notice of Louis. Though lame, she retained his favour for some time, and bore him four children. When

discarded for a successor she retired to a convent and took the veil, spending the rest of her life in religious exercises. Her *Réflexions* were published in 1680 and 1854, and a collection of *Letters* in 1767.

Lavater, JOHANN (1741-1801), a Swiss theologian, was born at Zurich. He took Orders in 1769, and soon gained a reputation as an orator, a casuist, a woman's preacher, and a mystic. He was an acquaintance of Goethe, of whom he has given a description; but his chief claim to modern regard is as a phrenologist and physiognomist, and his *Physiognomische Fragmente* owe much of their renown to their illustrations. Lavater died of a gunshot wound during the French occupation of Zurich.

Laveleye, ÉMILE LOUIS VICTOR DE (1822-92), a Belgian political economist, was born at Bruges, and educated at Ghent and Paris. He was appointed to the chair of Political Economy at Liège in 1864, and was a diligent contributor to magazines both home and foreign. Among his works are *Property and its Primitive Forms*, *Letters from Italy*, *Socialism of the Present Day*, *Elements of Political Economy*, and *The Balkan Peninsula*.

Lavender (*Larandula vera*), an aromatic undershrub, native to the south of Europe, belonging to the order Labiatae (q.v.), which is largely cultivated in France and in England for its perfume. It grows 2 or 3 feet high: its branches are polygonal; its leaves, linear, glaucous, and with revolute margins; and its flowers in spikes of verticillasters of the greyish-blue which takes its name from this plant. The calyx is ovate and ribbed, the corolla with distinctly-lobed lips, and the stamens bent forward. The flowering branches are largely used to protect linen from moth, and are imported from France in bales of 200 lbs. each. The essential oil of lavender is distilled from the flowers, and is imported in pound bottles and in tins. The plant is grown about Mitcham, in Surrey, but the French oil is cheaper than the English. *Lavender water* consists of the essential oil dissolved in rectified alcohol with other essences. *Red lavender drops* contain oil of rosemary and colouring matters. They are used as a stimulant in flatulence, hysteria, and faintness.

Lavender Water. By the distillation of the lavender flowers with water, a volatile oil known as *oil of lavender* is obtained, from which the lavender water is formed by dissolving it in spirits with the addition of rose-water or other perfume, and subsequent distillation. If the lavender flowers be distilled at once with spirits instead of with water, *spirits of lavender* are obtained consisting essentially of the oil dissolved in the alcoholic liquid.

Laver, a condiment obtained either from the common red seaweed, *Porphyra vulgaris*, or from the allied green species, *Ula Lactuca* and *U. latissima*, which are even more common upon our coasts. The seaweed is heated with stock and lemon juice, and is eaten as a sauce with roast mutton, its strong flavour of iodine being much relished by the initiated.

Lavoisier, ANTOINE LAURENT (1743-94), one of the founders of the modern theory of

chemistry, was born in Paris of a wealthy family. An essay on the best way of lighting Paris brought him into notice, and in 1768 he became an Academician. In 1769 he was appointed Farmer-General, and in 1776 he introduced improvements in the mode of making gunpowder. In 1769 he was made commissary of the Treasury. Besides establishing a new theory as to the nature of oxygen, he applied the principles of chemistry to agriculture, and made valuable researches in geology and kindred subjects. Among his works are an *Elementary Treatise on Chemistry*, and a work *On the Territorial Riches of France*. His services did not prevent his being guillotined.

Law, JOHN (1671-1729), the noted financier and company-promoter, was born at Edinburgh. The son in his early days was noted for his mathematical powers and his luck or skill in gambling. A visit to London led to his falling into debt and selling his estate of Lanryston to his mother, and terminated in a duel, a commuted death sentence, and an escape to the Continent, where he studied finance at Amsterdam. In 1700 he was in Scotland proposing a Council of Trade and other economical measures, and his proposal for a State Bank with a large issue of paper gained him a reputation as a financier in London. For some years then he travelled on the Continent, gambling and proposing financial schemes. In 1716 the French Regent allowed him to start a bank and issue paper. The success of this was so great as to encourage him to put forth his "Mississippi Scheme" for the settlement of Louisiana; and, in spite of the jealousy of the Parliament, his bank became in 1718 the Royal Bank, and he had control of the Mint. The scheme flourished during 1719 and the early part of 1720, and great fortunes were won and lost in speculation; but the crash came, and Law had to fly the country, his property being confiscated. Declining an invitation from Peter the Great to St. Petersburg, he settled for some years in England, and finally died at Venice.

Law, WILLIAM (1686-1761), a celebrated English non-juror clergyman, chiefly known to later generations as the author of the *Serious Call*, a collection of half-allegorical sketches of men and women with morals appended, which owes much of its renown to Dr. Johnson's praise of it. He took Orders in 1711, but refused the oath of allegiance at the accession of George I. His life was thenceforward spent chiefly in comparative retirement at King's Cliffe, where he established a girls' school, and where dwelt two ladies in a kind of religious sisterhood, one of these ladies being a Miss Gibbon, of whose family at Putney Law had been an inmate in 1727. He was friendly with the Wesleys, who, however, found his views too mystic. Among his works were *Three Letters to the Bishop of Bangor*, an attack on Mandeville's *Fable of the Bees*, and a condemnation of the stage. The *Serious Call* appeared in 1728.

Lawrence. 1. A town of Kansas, U.S.A., capital of Douglas county, situated on both sides of the river Kansas, 40 miles above its junction with the Missouri. It is a railway junction, and has a good

trade, one of its special industries being pork-packing. It contains the state university, and there are carriage-works, mills, and other industries. The town was founded by Abolitionists, and was consequently in bad odour, and was partly burnt in 1856, and again in 1863.

2. A town in Essex county, Massachusetts, U.S.A., on the banks of the Merrimac, and 26 miles N. of Boston. It has considerable manufactures, the water-power of the river being utilised by means of a dam and canals which distribute the power. The granite dam is 1,629 feet long. Four bridges, two of which are railway bridges, cross the river. The chief industries are cotton-, woollen-, and cloth-working, paper-making, and engine, boiler, and machinery shops.

Lawrence, HENRY MONTGOMERY, SIR (1806-57), an English soldier and statesman, was born in Ceylon, and entered the Bengal Artillery in 1823. He took part in the Burmese War of 1828, in the Afghan War of 1838, and in the Sikh Wars of 1845 and 1848, after the latter of which he was made K.C.B. He foresaw the Mutiny, and this enabled him successfully to hold out when in charge of the Residency at Lucknow. He died from a shell wound during the defence. The Lawrence Military Asylums owe their existence to the interest he took in the soldier.

Lawrence, JOHN, LORD (1811-79), known as the "Saviour of India" for his services during the Mutiny, brother of the above, was born at Richmond, Yorks. In 1827 he entered at Haileybury, where he carried off the chief prizes, and then entered the Indian Civil Service, the neighbourhood of Delhi being the chief scene of his early labours. In the Punjab he became very popular by reason of his protection of the peasants against the tyranny of the chiefs and the good system of land tenure which he introduced; and this popularity it was that enabled him to raise an army of 59,000 Sikhs and capture Delhi. In 1861 he received the Star of India, and in 1863 was appointed Governor-General. In 1869 he was made Baron Lawrence, and during 1870-73 was on the London School Board. He had strong opinions about the interference of England in Afghan affairs, and was opposed to the Afghan campaign of Lord Roberts.

Lawrence, THOMAS, SIR (1769-1830), an English painter and P.R.A. He was born in Bristol, and at the age of 18 he entered the Royal Academy as a student, and soon drew the attention of the world as a portrait-painter. George III. took him up, and caused him to be made A.R.A. in 1791. In 1798 he became R.A., in 1815 was knighted by the Regent, and in 1820 he succeeded Benjamin West as President of the Academy. Among the numerous subjects of his pencil were Pope Pius VII., Miss Farren the actress, John Kemble in character, Miss Siddons, Wellington, Metternich, Blücher, and the crowned heads of the Vienna Congress.

Lawson, SIR JOHN, English seaman, was born about 1608, and served in the Parliamentary army and fleet during the Civil War. He was afterwards with Penn in the Mediterranean, and was made

rear-admiral of England in 1652, vice-admiral of the Red, and admiral of the Blue in 1653, and immediately afterwards vice-admiral of England. In 1665 he was wounded, and died from his injury.

Layamon, an early English poet of whom little is known, was the son of Leuea or Leovenath, and was a priest at Ernly, on the bank of the Severn. He flourished during the 12th century, and his poem of *Brut d'Angleterre* is valuable as showing the transition of Anglo-Saxon to the English of Chaucer and the beginning of a unity of interest between the English and Celtic elements of the country. His poem was founded upon Wæe, and there are two texts extant which show a remarkable absence of French-derived words.

Layard, AUSTEN HENRY, SIR, G.C.B., was born in 1817. Born in Paris, he spent his boyhood in Italy, and at 16 went to London to study law. In 1839, while on the banks of the Tigris during an overland journey to Ceylon, he was struck by the ruins which were said to be those of Nineveh. In 1845 he obtained leave to explore, and in the following years brought to light four palaces, one of which is thought to have been built by Sardanapalus. Lord Stratford de Redcliffe gave him pecuniary aid in his researches, and Parliament made a grant for the purpose. He was Foreign Secretary (1861-66), and during the Russo-Turkish war was ambassador at Constantinople, and sympathised with the Turks. Among his writings are *Nineveh and its Remains* (1849), *Monuments of Nineveh* (1853), *Early Adventures in Persia, Babylonia, and Susiana* (1887).

Lazes, the westernmost branch of the Georgian race, who give their name to the mountainous region of Lazistan, on the south-east side of the Black Sea. Unlike the other members of the group, who are Christians, the Lazes are Mohammedans, and were all subjects of Turkey till 1878, when the rectification of frontiers after the Russo-Turkish War, assigned a considerable section of the nation (Batoum district) to Russia. Their speech differs little from the Mingrelian dialect of Georgian, but it has borrowed a large number of loan words from the surrounding Greek and Turkish populations. The Lazes are physically a fine race, brave, courteous, and fond of show in their picturesque national costume; they make excellent sailors, and many emigrate from their overcrowded upland valleys, seeking employment as artisans as far west as Constantinople. (Deyrolle, *Lazistan et Arménie*, in *Tour du Monde*, 1875-76.)

Lazzaroni (Italian, augmentative of *lazzaro*, a "leper" or "beggar"), a class peculiar to Naples, where, up to a recent period, they existed in large numbers. They found casual employment as messengers, porters, etc., but earned their livelihood chiefly by begging.

Lead (Pb. 206.4), being one of the commonly occurring metals, has been known from early times, and mention of it occurs in different places in the Scriptural writings. It was formerly, however, much confounded with tin, the two being regarded as varieties of the same metal, and distinguished

as *plumbum nigrum* and *plumbum candidum*. By the early alchemists lead was known by the sign of the planet Saturn (♄), who were also acquainted with some of the salts—*e.g.* sugar of lead. By the Romans the metal was employed for many of the purposes to which it is still applied, while solders of lead and tin were also used. It does not occur free to any extent in nature, though many of its compounds are widely distributed. Those almost exclusively employed for the production of the metal are the sulphide—*galena* (q.v.), and, to a less extent, the carbonate—*cerussite*, or *white lead ore*. The former occurs in many localities in Great Britain—*e.g.* Derbyshire, Cumberland, Cornwall, Wales, Scotland, in the Isle of Man—and abundantly in Spain, in the Hartz Mountains, and in the United States. The carbonate occurs frequently associated with the galena in the above localities. Other minerals also, as *anglesite*, *matlockite*, *crocoisite* *pyromorphite*, etc., contain lead, but are not used as sources of the metal. The smelting of lead is effected with more ease than that of most metals. It was produced in England during the Roman occupation, and remains of some of the ancient furnaces still exist. The method usually employed (known as the Welsh method) is briefly as follows:—The galena is mixed with a small quantity of lime and heated in a reverberatory furnace. During this heating, part of the sulphide is converted to sulphate and a part to oxide, sulphur dioxide being evolved. More lime is added and the temperature increased, when the sulphate and oxide both react upon the unchanged sulphide with formation of lead. The lime forms a thick slag with the earthy matter of the ore, which is raked off the surface of the metal. The lead so obtained is, however, impure, containing usually antimony and other foreign metals, which impair its quality. It is purified by remelting, and partly oxidising, the foreign metals being the first to oxidise, forming a scum on the surface which is taken off. The galena also frequently contains silver, which remains in the molten lead, and this can be profitably extracted, even when present in very small quantities. [SILVER, PATTINSON'S PROCESS, PARKE'S PROCESS.] Thus obtained and purified, lead is a blue-grey metal, with metallic lustre, which soon tarnishes by exposure. It may also be obtained in octahedral crystals. It is so soft that it can be cut by the finger-nail, and will mark paper. The hardness is, however, greatly increased by the presence of small quantities of antimony and other metals. It has a specific gravity of 11.3. It cannot be drawn into wire, but may be rolled into thin sheets. It melts at 327°C ., and with tin, etc., forms alloys, which melt at comparatively low temperatures. It is not acted upon to any extent by sulphuric acid or by muriatic acid. It is hence used for making the chambers in the manufacture of the former acids. It finds very many applications in industrial processes, dependent chiefly on its low melting-point, its softness, malleability, and its permanence if exposed to the atmosphere. Water, however, slowly corrodes lead, the action being increased by certain salts, but diminished by others. Hence, traces of lead are

usually found in water kept in lead cisterns or passing through lead pipes, and may give rise to lead-poisoning. It forms many oxides, chief of which are *litharge* or *massicot*, the monoxide and PbO ; and *red-lead*, Pb_3O_4 . The latter is a scarlet crystalline powder obtained by carefully heating powdered litharge. It is largely used as a pigment and in the production of lead-glass—*e.g.* flint-glass. The salts of lead correspond with the monoxide—*e.g.* PbCl_2 , etc. Of these most are insoluble, the nitrate and acetate being the only common soluble lead salts. The acetate known as *sugar of lead* is a white crystalline powder obtained by the action of crude acetic acid upon litharge. It has been long known, and used to a small extent medicinally, chiefly in conjunction with opium, as an astringent and sedative. The *chromates* of lead are used as yellow pigments, whilst a basic carbonate forms a very common white pigment under the name of *white-lead*. It has the disadvantage of blackening by action of sulphur compounds. It was formerly chiefly prepared by the *Dutch process*, which consisted of placing the lead in thin sheets in pots of weak vinegar, and surrounding the pots with decaying tan or dung. The acetate is first formed, which is converted by the carbonic acid evolved during the putrefaction into the basic white lead. Other methods have now largely superseded this process. All the compounds of lead are poisonous, and even in small doses produce in time cumulative or chronic lead-poisoning, observed more especially in occupations involving the use of the carbonate of lead. Qualitatively, it is usually recognised in its compounds by its insoluble chloride, which dissolves in hot water, and, quantitatively, it is usually estimated as the sulphate. The atomic weight 206.41 assigned to it was carefully determined by the chemist Stas.

Lead, SUGAR OF. [LEAD.]

Lead, THE, the simplest form of sounding apparatus, whereby a ship discovers the depth of water beneath her. It is composed of a long block of lead of from 7 lbs. to 14 lbs. weight, attached by means of a thong to a long line called the lead-line. The lower end of the lead is hollowed to receive tallow, to which, in sounding, some specimen of the bottom may adhere. The line, about 20 fathoms long, is thus marked: 2 fathoms, a piece of leather with two strips; 3 fathoms, a piece of leather with three strips; 5 fathoms, white rag; 7 fathoms, red rag; 10 fathoms, a piece of leather with a hole in it; 13 fathoms, blue rag; 15 fathoms, white rag; 17 fathoms, red rag; 20 fathoms, two knots. For deep-sea work, leads weigh as much as 30 lbs.

Lead, WHITE. [LEAD.]

Leaf, a lateral appendage of the stem of a plant, differing in form and structure from the stem that bears it. Thallophytes (q.v.) have no leaves, and those of mosses (q.v.) are generally only a single layer of cells. Those of the higher plants (ferns and their allies and flowering-plants) are at first merely protuberances of cellular tissue, produced laterally in acropetal (q.v.) succession from the apex of a shoot; but when mature they

have an epidermis (q.v.), internal cellular tissue or *mesophyll*, and a fibro-vascular skeleton of so-called *ribs*, *veins*, or *nerves*. Leaves may be circular in section, as in onions and rushes, or flattened in a vertical plane, as in *Iris*, but are most commonly flattened horizontally, and the upper and under surfaces, differing in structure and function, are termed *dorsi-ventral*. In ordinary foliage-leaves the upper surface is a darker green, and has the *palisade-tissue* of closely-packed prismatic assimilating cells immediately below its epidermis, whilst the lower surface has more stomata (q.v.) and loose *spongy parenchyma* (q.v.), a transpiring tissue, internally. Ordinary green foliage-leaves have three chief functions:—(1) *Assimilation* (q.v.), or the taking-in and decomposition, in the presence of chlorophyll and under the influence of light, of carbon dioxide from the air, forming carbo-hydrates and liberating oxygen; (2) *transpiration*, or giving off water-vapour through the stomata, especially in dry weather; and (3) *respiration* (q.v.), or inhaling small volumes of oxygen and exhaling carbon dioxide. In addition to these, many of the processes of metabolism (q.v.) go on in the leaf, which is at once, as it were, the mouth, lungs, and stomach of the plant. Though plants usually obtain their nitrogen from the soil by their roots, some leaves, especially those with glandular hairs, may take in ammonia compounds in dew or rain-water, and those of the various carnivorous plants (q.v.) are adapted for obtaining nitrogen from captured insects or other animal matter, either as a product of decay or of a true digestive process. Leaves in some cases act as climbing organs, either by twisting their stalks round the support, as in *Clematis*, or by being partly transformed into tendrils (q.v.). In addition to ordinary green foliage-leaves, there are on various special regions of the stem structures which in origin, development, and structure are truly leaves, though very variously modified. Such are the *cotyledons* (q.v.), or primary leaves of the seedling, which often serve as a food reservoir, though sometimes (in epigeal germination [q.v.]) afterwards becoming green and acting as typical leaves. Underground stems bear *leaf-scales* or *cataphyllary leaves*, generally without chlorophyll and broad-based, representing the sheaths of ordinary leaves. These in bulbs are fleshy and act as food reservoirs, whilst in the tooth-wort (*Lathraea*) they have absorptive glands and take in food from decaying leaves. On the aerial stems of many parasites and saprophytes the leaves are represented by similar reduced scales and outside buds; they perform, under the name of *perulae*, a protective function. In the region of the inflorescence (q.v.), in addition to the variously-modified leaves, sepals, petals, stamens, and carpels that form the bulk of each flower, there are reduced *hypsophyllary leaves* or *bracts* (q.v.), narrow at the base and variously coloured, representing sessile leaf-blades.

Leaf Insects, a number of insects forming the genus *Phyllium* of the family Phasmidæ. The whole insect is much like a leaf, and the legs are often also expanded out into leaf-like structure. They usually live in the tropics, and there may attain a

size of over an inch in length. They are sluggish insects, being protected by their *mimicry* (q.v.).

Leaf-nosed Bats, the family Rhinolophidæ, from temperate and tropical parts of the eastern hemisphere. They are distinguished by their enormous leaf-like growths on and around the nostrils, and the cusped molars fitted to crush the wing-cases of the beetles on which they feed.

League, three miles; three nautical miles, *i.e.* the 20th part of a degree of a great circle, or 5,560 metres.

Leake, SIR JOHN, English naval commander, was born in 1656. He early entered the navy, and was in 1688 promoted to be commander. He was posted in 1689 into the *Dartmouth*, in which he most gallantly led the historic relief of Londonderry in face of an army of 30,000 men. He took part in the reduction of Cork, and in the battle of Cape Bar-fleur. In 1694 Leake went to the Mediterranean, where he assisted in the blockade of Toulon. In 1702 he was made Governor and commander-in-chief at Newfoundland. At the end of the same year he attained flag-rank. He continued employed in responsible command, assisted in the capture of Gibraltar and the battle of Malaga, where he was wounded, and became commander-in-chief in the Mediterranean. He co-operated in the reduction of Barcelona, raised the subsequent French siege of that place, captured Alicante, and restored Majorca, Iviça, and Palma to Spain. In 1708 he was promoted to be Admiral of the Fleet, and, returning to the Mediterranean, captured Sardinia and Minorca. He subsequently joined the Board of Admiralty, refused a peerage, and in 1712, once more in command, captured Dunkirk. He died in 1720.

Leake, or LAKE, SIR ANDREW, naval commander, born about 1660, became a captain in 1690. In 1700 he was commodore at Newfoundland, and in 1702 was present at the attack on Vigo. He assisted at the capture of Gibraltar, and at the battle of Malaga he was mortally wounded.

Leap Year. The true solar year is 365 days 5 hours 48 minutes 50 seconds long, so if one year begins at 12 o'clock midnight, the next should rightly start about 6 a.m., and the following one at 12 noon. This would cause great inconvenience, and to avoid it an extra day is introduced into the month of February every fourth year, which is called leap year. Usually February has 28 days, but in leap year it has 29. The year whose number is exactly divisible by four is leap year. The correction of one day in four years is rather too big, and to compensate for it the extra day is omitted three times in every four centuries. That century the number of whose year is exactly divisible by 400 is a leap year, the others are not.

Lear, EDWARD (1812–88), English painter and author, was born in London. From 1832–36 he was at Knowsley in the family of the Earl of Derby, and drew plates for the *Knowsley Menagerie*. It was for the Earl's grandchildren that he composed his *Book of Nonsense*, which was followed by many other nonsense books at intervals, which attained

almost as much popularity as the original book. In 1837 he left England on account of his health, and stayed for a time in Rome, and sketched about Southern Europe, the result being his *Landscape-Painter in Greece and Albania*.

Lease. A lease or letting is sometimes termed a demise. He who lets land, whether for agricultural purposes or merely a piece of land with a dwelling-house thereon, is called the lessor, and he to whom land is let is called the lessee. A lease is not strictly a conveyance, though it is sometimes so termed. It is merely an interest in land or houses for a certain time and on certain specified terms. The fact of a lease for years being treated as an estate does not alter its nature as above explained. The reservation of a rent is not essential in a lease, but payment of rent is now the chief condition on which lands are let. To constitute a valid lease it is necessary that it should be by deed (*i.e.* under seal), and that the subject of it should be demised or let for a shorter period than the lessor's interest therein; for if a man parts with all his interest, the document creating such interest, whatever terms be used therein, is an assignment, and not a lease. The relation created by a lease between the lessor and the lessee is that of landlord and tenant on certain specified terms (varying more or less the ordinary relation of landlord and tenant). The lessor has a reversion in the land demised—that is, after the expiration of the lease, the land reverts to him. The lessor, by virtue of this reversion, has the power of distraining on the land for the rent agreed upon, and for the service which may be due by the terms of the lease and fealty is always due to the lessor. The ordinary lease is that for a term of years, by which lease a rent, generally payable in money at stated times, is reserved to the lessor. These are usually quarterly payments. In the absence of express agreement to the contrary, there is no suspension of rent in case of fire.

Least Squares, METHOD OF. In making measurements, or using instruments of any kind, different observations of the same thing do not agree. Besides errors of the instrument which can be corrected in different ways, other errors, not reducible to any law, and often depending on the observer himself, still remain. From the number of observations taken, that value has to be found which is nearest to the truth. In direct observations on a single quantity the arithmetical mean gives the best result, but this is not the case with observations on several quantities. The method of least squares is then employed. It is based on the theory of probability, and is much used in physical research.

Leather, a substance obtained by subjecting the skins of certain animals to processes which prevent decomposition, and at the same time render them tough, supple, and insoluble and unalterable in water. Technically, a distinction is made between the "hides" of horses, oxen, and other large animals, and the "skins" of calves, sheep, goats, etc. The various kinds of animal skin used for leather are composed of dense bunches of a fibrous gelatinous material called collagen, the intervals

between which are filled with an albuminoid substance termed corrin. When brought into contact with tannin (q.v.) (for which may be substituted a mineral salt) the collagen and corrin combine with the tannin and become the insoluble and unalterable compound known as tanno-gelatin. A large proportion of the skin is furnished by animals slaughtered at home for other purposes, the ox being the most important. Ox-hides, either wet or dry salted, or merely dried, are imported in great quantities from Australia, the Cape of Good Hope, South America, and other parts of the world. East India furnishes an abundant supply of the small hides called "kips," which are already salted and tanned when they reach England. In addition to the large number of sheepskins produced at home, they are brought to England from abroad, especially from Australia, New Zealand, the Cape, and Buenos Ayres. Other important skins are the buffalo-hides from the East Indies, the Malay Peninsula, and Java, the horse-hides of South America, the goat-skins and kid-skins of Asia Minor, the East Indies, and the Cape, and the sealskins from Greenland and Newfoundland.

The most important of the processes by which leather is produced is that known as *tanning*. Before the tanning commences, it is necessary to unhair and flesh the hides, which are then hung or laid one above the other in a pit containing tan liquor or "ooze." The most important ingredient in this solution is the bark of the oak, which furnishes the safest and most valuable kind of tannin; owing, however, to the length of time required when the process is carried on by means of oak tannin alone, recourse is now usually had to more powerful agents also, *e.g.* the bark of the hemlock, birch, and mimosa, nutgalls, and the powdered leaves and young shoots of the sumac. Strong preparations should, however, be used with caution, as they tend to render the leather hard and inflexible. During the earlier stages of the tanning especially, it is necessary that the ooze should be weak, stronger liquor being used in each of the successive baths in which the skin is placed. At first the skins are shifted or turned over twice or oftener in the course of a day; but they are afterwards allowed to lie for a longer time, and finally remain in the same pit for several weeks, with raw bark placed between the layers. They are then piled up under a covering which keeps off the light, and drained; the process of drying is completed by hanging them in a loft. The final stages of tanning consist of dampening, scouring, oiling, smoothing by means of a "striking-pin," and rolling over a smooth surface. The skin is then handed over to the currier, by whom it is subjected to a number of finishing operations, the most important being the "stuffing," which is effected by softening the skin in water, and then allowing the water to evaporate, so as to admit a mixture of tallow and cod-oil, which has been previously applied to the surface.

The process called *taning*, usually employed in the preparation of furriers' skins and the manufacture of glove leather and the uppers of ladies' boots, differs considerably, according to the skin used, but it bears a general resemblance to tanning,

excepting that mineral salts, such as common salt, alum, or iron salts are used instead of tannin. In *shamoying* some fatty substance such as fish-oil is gradually worked into the skin by means of stocks, and unites with the collagen and corrin to form a soft and spongy material; originally the skin of the Alpine chamois was employed for this purpose (whence the name), but most shamoy-leather is now made from sheepskins. Continuous rubbing, working, and stretching are essential features both of tawing and shamoying.

Some of the best-known kinds of leather are *morocco*, a dyed and grained leather, originally prepared by tanning goatskins in sumac, but now often made of split sheepskins or calfskins; *roan*, a sheepskin leather which resembles morocco, excepting that it is smooth instead of grained; and *russia* leather, any thin, smooth leather in the preparation of which the oil of birch-bark is employed.

Lebanon, a mountain range of Syria, to the north of Palestine, stretching from lat. 33° to 34° N. The name signifies "White," this characteristic proceeding from the whitish colour of the limestone and chalk composing the mountains. The range consists of the two almost parallel ranges from N. to S. of Lebanon on the W., and Anti-Lebanus on the E., enclosing the Buka, a valley which narrows towards the S. This valley is watered by two rivers which rise near each other, the El-Asi (ancient Orontes) flowing N., and the Litany, flowing S. and then W., and there are numerous streams between the different mountain spurs. The line of geological cleavage is, generally speaking, from N. to S., and there are traces of volcanic and of glacial action. The spurs generally trend E. and W., but there are some parallel to the general direction of the chain. The west of Lebanon slopes to the sea, and the margin between mountain and coast is often very narrow, and this western region has the ordinary trees, shrubs, etc., of the neighbouring parts of Syria. The eastern part is barren, save for a few plants and coarse brushwood. The mountain region bears dwarf oaks, and then, higher, tall pines, till in a belt from 4,000 to 6,000 feet occur the cypress and the noted cedar of Lebanon. The south parts generally are more fertile than the N., and the W. than the E. The chief heights, which, however, are not abrupt, are in the N. Zahr el Kazib is 10,000 feet high, the pass from Baalbec to Tripoli 8,351 feet, that of the French route from Beyrout to Damascus 4,700, and the pass to Sidon 6,000. Sunnim, visible from Beyrout, is about 9,000 feet high. The population are chiefly Syrian, their numerical order being Maronites, Orthodox Greeks, Druses, and Mohammedans. Since the religious outbreaks of 1860 the province of Lebanon Proper, 87 square miles in extent, has been administered by a Christian governor, appointed through European intervention. The people are a fine race, fond of gay colours, and practise tattooing. They employ themselves in cattle-breeding, in cultivating the walnut, olive, mulberry, vine (for home use), wheat, barley, sorghum, and tobacco; coal, bitumen, and petroleum are found.

Le Brun, CHARLES (1619–90), French painter, was born at Paris, and at the age of 15 attracted the notice of Poussin by his work. The two went to Rome together in 1642, and Le Brun remained there for four years. He then returned to Paris, and was patronised by Fouquet, and was in favour with Mazarin and Colbert. He was the moving spirit in the establishment of the Academy of Painting and Sculpture, the French Academy at Rome, and the Gobelins. In 1660 his designs for decorations at the king's triumphal entry pleased Louis, and his *Alexander and the Family of Darius* obtained for him nobility, a pension, and the post of royal painter. He decorated Versailles and the Louvre, but the death of his patron Colbert put him in the shade, and he died neglected.

Lecky, WILLIAM EDWARD, was born near Dublin in 1838, and graduated at Trinity College, Dublin, in 1859. His first notable work was a series of sketches of Swift, Flood, Grattan, and O'Connell, as leaders of public opinion in Ireland (1861); but his reputation chiefly rests upon his *History of the Rise and Influence of the Spirit of Rationalism in Europe* (1865), and his *History of European Morals from Augustus to Charlemagne* (1869), with its excellent chapters on hospitals and the position of women. In 1878–90 he produced a *History of England in the 18th Century*.

Leclaire, EDMÉ JEAN (1801–72), a French capitalist and experimentalist in the region of union of capital and labour. He began life as a farm-labourer, but came to Paris as a painter's apprentice, and by his energy won a good position. He seems to have had the good of the working men at heart, and his system of profit-sharing (q.v.), which began in 1842, has had important results.

Leclanché Cell is a form of primary battery extensively used for ringing bells and similar purposes. A square glass jar contains a zinc rod and a carbon plate in a solution of ammonium chloride. The carbon plate is in a porous pot packed with a mixture of equal bulks of coarsely-powdered retort carbon and manganese dioxide. The porous pot is sealed at the top with pitch or wax, and a lead cap, cast on to the carbon plate, serves for the attachment of a binding-screw. The zinc is dissolved in the ammonium chloride, forming zinc chloride, ammonia, and hydrogen:—



Polarisation is reduced by the action of the manganese dioxide, which oxidises the hydrogen:—



The current soon falls off if the circuit is closed for more than a few minutes, but the cell quickly recovers itself. The manganese and carbon powders are sometimes formed by compression into *agglomerate* blocks, two of which are held in contact with the carbon plate by rubber bands, thus rendering the porous pot unnecessary and reducing the resistance of the cell.

Leconte de Lisle, French poet and man of letters, was born in 1818 in the Isle of Réunion. After travelling he adopted a literary life at Paris, and gave all his sympathies to Greek and Eastern

ideals. He succeeded Victor Hugo in 1886 at the Academy. Besides his *Poésies Complètes* (1858), *Poèmes Barbares* (1862), *Poèmes Tragiques* (1884), he translated the Orphic hymns, Hesiod, Homer, Theocritus, Anacreon, Æschylus, Sophocles, Euripides, and Horace.

Ledger, in book-keeping, the most important account-book, in which all the debits appear on one side and all the credit amounts on the other.

Ledru-Rollin, ALEXANDRE AUGUSTE (1807-74), a French politician and revolutionist, was born and educated at Paris, where he was called to the bar. After the revolution of 1830 he pleaded the causes of defendants in political trials, wrote political tracts, and edited republican newspapers, and in the years preceding the movement of 1848 gained the title of "Tribune of the Revolution." Elected deputy in 1841, he advocated liberty of labour and universal suffrage. Under the provisional government he was Minister of the Interior, but lost his former influence. In 1849 his determined opposition to Louis Napoleon caused him to leave France and settle in London, where he joined the Revolutionary Committee of Europe and wrote a book on the *Décadence de l'Angleterre*. In 1870 he returned to Paris, but would not sit till 1874. His works were published in 1879.

Lee, that quarter towards which the wind blows; the side sheltered from the wind. A ship is said to be on a lee shore when she is near the land with the wind blowing right upon it. A lee-board is a strong frame of planking affixed to the side of a shallow-draught vessel, such as a river-barge, and capable of being let down into the water when the craft is close-hauled. It tends to prevent her from falling to leeward, and has the same effect as a centre-board.

Lee, ROBERT EDWARD (1807-70), a noted Confederate general in the American War of Secession, was born in Westmoreland county, Virginia, his father having been a general in the War of Independence and afterwards Governor of Virginia. The son was at West Point 1825-29, and then joined the Engineers. He was captain under General Scott in the Mexican War, and the siege of Chapultepec brought him a brevet colonelcy. In 1852 he was president of West Point, and in 1855 was lieutenant-colonel of the 2nd Cavalry in Texas. In 1861 he was colonel of the 1st Cavalry, but at the beginning of the troubles resigned his position in the U.S. army, and was appointed head of the Virginian forces, and was one of the five generals chosen by the Confederate Congress. In 1862 he commanded the army of North Virginia, and forced McLellan to abandon the siege of Richmond, crossed the Rapidan, defeated Pope, and invaded Maryland, but had to recross the Potomac, and in December he defeated the Federal forces near Fredericksburg. In the spring of 1863 he forced them again to retreat, but after the battle of Gettysburg was himself forced to retire into Virginia. The year 1864, when Grant crossed the Rapidan, saw the beginning of the end, and in April Lee, seeing there was no further hope of combating the resources of the Northerners, surrendered

his army. He was appointed in the same year president of the university at Lexington, Virginia, a post which he held for the rest of his life.

Leech, the popular name of worms belonging to the sub-class Hirudinea. The best-known form is the common leech (*Hirudo medicinalis*), which is used to suck blood from congested parts. Though not so often employed as formerly, it is reared in large numbers in ponds in Hungary. It possesses three horny jaws with finely-serrated edges, which in cutting through the skin are used like saws, producing a wound which bleeds freely, but heals quickly. Another species is the Horse-leech, common in ponds in Britain.

Leech, JOHN (1817-64), English draughtsman and humorist, was born in London and educated at Charterhouse, where he was the contemporary of Thackeray. He early displayed skill as a caricaturist, and when he betook himself to the study of medicine at St. Bartholomew's Hospital he was noted for the excellence of his anatomical drawings. He published a set of *Etchings and Sketchings* at the age of 18, and in 1838 he was at work on *Bell's Life*. In 1841 he made his appearance in *Punch*, and remained for life a member of its staff. His cartoons and his plates illustrative of various phases of social life are well known to all readers of *Punch*. He also worked for *Once a Week*, *The Illustrated London News*, Hood's *Comic Annual*, Charles Dickens's *Comic Histories*, the *Handley Cross* series of sporting novels, and the *Bon Gaultier Ballads*.

Leeds, the most populous of Yorkshire towns, municipal and parliamentary (5 members) borough, is situated upon the Aire in the N.W. of the West Riding of Yorks, 25 miles S.W. of York, and 196 N.W. of London. It is the great centre of the English cloth-trade, very many hands being employed in the ready-made clothing trade, and the woollen industries employing great numbers both in the town and in the surrounding villages. Business to the amount of £11,000,000 a year is transacted in these branches, and of late years the iron trade has been largely developed. The town has also large tanneries and boot factories, and other industries are locomotive- and machine-building, and glass, paper, oil, tobacco, chemical, worsted, silk, and earthenware works. Goods are easily moved by railway, river, and canal. There are three markets, and among the principal buildings are the church of St. Peter, Kirkgate, with a tower 139 feet high, the "Laudian" church of St. John (1634), a fine town hall with large organ, municipal buildings, grammar school, royal exchange, stock exchange, and Yorkshire college established in 1874. There are five railway stations, and the town is traversed by tramways, on some of which steam power is used. Roundhay Park is a recreation ground, and a fine view is to be had from Woodhouse Moor, which has also been planted with trees. Kirkstall Abbey is about three miles away. Among the names connected with Leeds are those of Dr. Priestley, who founded a library, and Dr. Hook, who was an energetic vicar.

2. A prettily-situated village in Kent, upon the

Len, noted for its fine moated castle of great anti-quarian and historical interest.

Leeds, DUKE OF, THOMAS OSBORNE (1631-1712), was the son of a Yorkshire baronet. In 1661 he became M.P. for York, and was a staunch upholder of Church and king. His principles brought him preferment and the favour of the king, and in 1674 he was made Lord High Treasurer and Earl of Danby. He acted as a go-between to Charles II. and Louis XIV., and in 1678 was impeached on this account by the Commons, who kept him in the Tower till 1683, notwithstanding the king's pardon. Not in favour with James II., he joined in inviting William III., and was made Marquis of Carmarthen and President of the Council, being in 1694 advanced to the Dukedom of Leeds. The next year he was again impeached for taking bribes, and in 1699 retired from public life, though he appeared again in 1710 to speak in defence of Dr. Sacheverel.

Leek (*Allium Porrum*), an esculent plant, closely allied to the onion, probably of Eastern origin, and recorded as cultivated in ancient Egypt. It has long been cultivated in England, and more extensively in Wales and Scotland, the whole of the plant above ground being employed in stews and soups. In France the stems are blanched by being earthed up. The leek is the badge of Welshmen, St. David having directed them to wear it in a battle with the Saxons, in the 6th century, in which they were victorious.

Leeuwarden, capital of Friesland, in Holland, is an inland town 17 miles from Haarlem, and 32 miles W. of Groningen. It has good railway and canal communication with each of those towns, and is in a prosperous condition. Its tasteful parks, pleasure-grounds, and drives have gained for it the name of the "Frisian Hague." Among its buildings are the Church of the Jacobins, where the Frisian Stadtholders were formerly buried; an 18th-century town-house, with valuable archives; a 16th-century weigh-house; a palace; and a brick house of 1502. There is a trade in timber, fruit, cattle, and boat-building, iron-founding, copper- and lead-working, and sewing-machines, safes, organs, and tobacco are manufactured.

Leeuwenhoek, ANTON VAN (1632-73), a noted microscopist, was born at Delft. His practice as a glass-grinder led him to see the advantage of employing a single lens of short focus in microscopic work. In 1673 he was introduced by De Graaf to the Royal Society, and gave an account of his views in their *Transactions*, and in 1680 he was made a fellow. Among his many discoveries, perhaps the most important was that of capillary circulation, which he demonstrated on various animals, and the different shapes of blood discs. He also strongly advocated the theory "omne vivum ex ovo" in opposition to the supporters of the theory of spontaneous generation. He made discoveries, too, relating to the teeth, the lens of the eye, the epidermis, spermatozoa, scales on insects' wings, spiders, fleas, trees, and plants. The most complete edition of his works was published at Leyden (1719-22).

Leg. The leg is divided into the thigh, the leg proper, ankle, and foot. The bone of the thigh is called the femur, those of the leg are the tibia and fibula. The bones of the ANKLE and FOOT are described under those heads. The great muscles of the calf are the gastrocnemius and soleus; they are inserted by means of the tendo Achillis, the largest tendon in the body, into the prominence of the os calcis. The chief muscles of the front of the leg are the peronei muscles on the outer side, the extensor muscles of the toes, and the tibialis anticus. A considerable extent of the anterior surface of the tibia is uncovered by muscles, and lies immediately beneath the skin. The shin bone, as it is called, is thus particularly liable to injury. The chief arteries of the leg are the anterior and posterior tibial arteries, which result from the division of the popliteal artery, which is the continuation of the great artery of the thigh. Artificial legs are frequently used, when a person has suffered amputation. Wood, vulcanite, gutta-percha, etc., are all employed, but the so-called *cork legs* are usually made of willow wood.

Legacy, a gift or bequest of goods and chattels by will. The person to whom it is given is termed the legatee. The bequest requires the assent of the executor or administrator to the will annexed as the case may be; but before such assent, the bequest is transmissible to the personal representatives of the legatee, and will pass by his will. The executor or administrator is not bound to admit that there is anything due to the legatee till the deceased's debts and expenses attending the administration of the estate are discharged. Legacies are of two kinds, general and specific. A general legacy is when it is so given as not to amount to a bequest of a particular thing or a particular fund of the testator. A specific legacy is a bequest of a specified thing, or a specific part of the testator's estate. There is also a third description of legacy partaking somewhat of the nature of both kinds already mentioned, as a gift of so much money with reference to a particular fund for payment. This is called a *demonstrative* legacy, but it so far differs from one properly specific that, if the fund pointed out fails on any account, the legatee will be paid out of the general assets. It may be stated as a general rule that legacies are payable twelve months after the death of the testator, and with interest from that time at 4 per cent. unless the testator has made some special provision as to the time of payment and interest. When a specific legacy consists of some certain chattel, whether real as a lease for years, or personal, as a particular house, the legatee after assent by the executor to the legacy may take possession of it or sue for it by action at law; but where the specific legacy consists of money, etc., and in all cases of general and demonstrative legacies, the action at law lies unless the executor has for some new consideration beneficial to himself expressly promised payment. As a general rule, therefore, it may be stated that the remedies of legatees against law are the subject of administration in the Courts of Equity. Legacies

pay a duty unless they be expressly given free of claim, in which case the deceased's estate pays it. A stranger in blood pays 10 per cent., nephews and nieces 3 per cent., uncles and aunts of the deceased 5 per cent., children 1 per cent. Legacies to a wife by her husband, or to a husband by his wife, are free of duty.

Legate, a messenger or ambassador sent by the Pope to any country. They are of three kinds. (1) *Legati a latere*, "from the side" of the Pope, who are always cardinals, with authority almost equal to that of the Pope himself. (2) *Legati missi* or "apostolic nuncios," sent with absolute authority on some special mission. (3) *Legati nati*, who were supposed to exercise the legatine power in consequence of the office they held. From the reign of Henry I. the Archbishops of Canterbury were commonly regarded as *legati nati*, but their authority was frequently superseded by that of *legati a latere* and *legati missi*. In England, as in other countries, strenuous resistance was offered to the claim of the Papal legates to exercise an ecclesiastical jurisdiction independent of the civil ruler, as representatives of a higher spiritual power. The Statute of Præmunire (1393) by denying the authority of any tribunal outside the realm made it illegal to act as legate.

Legendre, ADRIEN MARIE (1752–1833), a French mathematician, contemporary of Laplace and Lagrange, was born at Paris, where he studied at the Collège Mazarin. In 1744 he contributed to his tutor's *Traité de Mécanique*. He was appointed professor of the École Militaire, and then of the École Normale, and in 1782 he obtained a prize from the Berlin Academy for a *Dissertation sur la Question de Balistique*. The next year he published *Recherches sur la Figure des Planètes*. Later he was appointed one of the commissioners for connecting Paris and Greenwich by triangulation, and was one of those employed to work out the details of the metrical system introduced by the Revolution, and to determine the length of the metre. He also published *Elements of Geometry*, and made discoveries in integral calculus, the method of least squares, and elliptic functions.

Leghorn (LIVORNO), chief town of the province of Leghorn on the west coast of Italy, and next in commercial importance to Genoa and Naples. It is 15 miles by railway from Pisa, and stands on low ground backed by a ridge of hills, one of which is Monte Nero topped by an ancient monastery. Within the walls are broad streets of large houses with extensive squares, and outside are suburban villas. There are some fine statues, and among the chief buildings are a cathedral, with façade by Inigo Jones, a town hall, oil warehouses built by Cosmo III. in 1705, subterranean reservoirs, and a Jewish synagogue almost rivalling that of Amsterdam. In the disused Protestant cemetery Smollett was buried. There is an "old port," protected from all winds, and having docks to the S. and E., and communicating with a network of canals—one reaching to the Arno—which have led to part of the city being called "Little Venice." The new port is protected by a breakwater

a mile and a quarter from shore, and further improvements have been made with a view to protecting it from the S. winds. Vessels moored to the breakwater are in safety. The principal trade is with Great Britain, France, and the United States, and there is a rapidly-increasing coasting-trade. Ship-building and the manufacture of coral ornaments are important industries, the latter employing many women. Among the exports, which approach £200,000 in value, are wine, silk, marble, oil, hemp, fruit, leather, coral, and hats.

Legion, a constituent part of the ancient Roman army, the organisation of which differed in different epochs. During the republican period it contained 4,500 men—viz. 1,200 *hastati*, 1,200 *principes*, 600 *triarii*, 1,200 *velites* (skirmishers), and 300 *equites* (cavalry), recruited from the richer class. The *velites* were the "youngest and poorest," the *hastati* "those next them," the *principes* the "most vigorous in years," the *triarii* the "oldest." The *hastati*, *principes*, and *triarii* formed three lines, ranged one behind the other in the order named. Each line contained 10 maniples, consisting in the first two of 120, in the third of 60 men apiece. The officer commanding a manipule was called a centurion. To every legion were attached six "military tribunes," who took the command in rotation, each for two months. Under Marius the three lines were amalgamated, and the whole legion divided into 10 cohorts, each containing 3 maniples. During the civil wars the tribunes were replaced by a permanent commander called a *legatus*. Under the early Empire the total number of men was raised to 6,000, exclusive of cavalry and *velites*. Various other changes were subsequently introduced.

Legion of Honour, an order of merit founded by Napoleon I. in 1802. All citizens were eligible, no regard being paid to differences of birth or social position. On their admission members took a solemn oath that they would do all in their power to uphold the republican institutions of France. The order has been several times remodelled since its first institution. It now comprises five classes—viz. grand crosses, grand officers, commanders, officers, and chevaliers or knights, the total number of members being upwards of 30,000. Excepting in time of war, 25 years' public service is an indispensable qualification, and, in the case of three-fifths of the members, this must have been of a military or naval character. At present the decoration is a white enamelled star of five rays, bearing on the obverse a figure representing the Republic and the words "République Française, 1870," on the reverse, two tricolor flags with the motto "Honneur et Patrie;" the ribbon is of watered scarlet silk.

Legume, the fruit characteristic of the order Leguminosæ (q.v.), formed from one superior carpel, with a pericarp that becomes dry in ripening, bears one row of ovules down its ventral suture, and splits down both sutures into two valves. It sometimes does this with some violence, so as to discharge the seeds, as in the furze. In some genera there are transverse septa between the seeds, as in

Cassia Fistula, and in *Astragalus* a longitudinal partition.

Legumin is an albuminoid substance which occurs largely in the seeds of leguminous plants as lentils, peas, haricot beans, etc., in sweet and bitter almonds and other sources. Its exact composition is unknown, and but little of its properties certainly determined. It appears to be almost identical with *Casein* (q.v.), and is also known by the name of *vegetable casein*. It is best obtained from an extract of peas and by precipitation by acids appears as a flocculent powder soluble in cold water, precipitated by acids, but redissolved by excess and coagulable by heat.

Leguminosæ, a large natural order of dicotyledonous plants, comprising some 7,000 species in about 550 genera. They occur in all parts of the globe; but are specially abundant in the tropics. Including plants of all sizes, the order—one of the first recognised as natural—agrees in having scattered, stipulate leaves, generally compound; an inferior calyx of five united sepals, of which the odd one is anterior—thus differing from that of the Rosaceæ (q.v.)—five free perigynous petals; stamens ten, and monadelphous or diadelphous, or indefinite in number and free; and almost always a single superior many-seeded carpel which forms a legume (q.v.), and contains exalbuminous seeds with large cotyledons. The order is divided into three sub-orders: the *Papilionaceæ*, to which all British, and most European, members of the order belong, named from its butterfly-like corolla (q.v.), with one large posterior petal or *standard*, two lateral or *wing* petals, and two, sometimes united, *keel* petals, and ten stamens; the *Cæsalpinieæ*, with monosymmetric but not papilionaceous corollas and ten stamens; and the *Mimosææ*, with polysymmetric flowers having valvate petals and an indefinite number of stamens. No order except the grasses, and perhaps the palms, is so useful to man. Besides some valuable timbers and fibres, it yields such important dyes as indigo (q.v.) and logwood (q.v.); the chief gums, including gum-arabic, gum-tragacanth and wattle-gums; such fodder plants as clover, lucerne, and sainfoin; and, most useful of all, the pulses, peas, beans, lentils, etc., so rich in nitrogenous matter. The order is, in fact, often spoken of as the pea and bean tribe. Several members of the order are poisonous, especially in their seeds, as the laburnum (q.v.) and the Calabar or ordeal bean (*Physostigma venenosum*).

Leibnitz, GOTTFRIED WILHELM (1646–1716), the great philosopher, mathematician, and man of business, was born at Leipzig. His father died when the son was six years old, and from that time the boy educated himself. He was fond of history, learnt Latin, and then taught himself Greek and logic. In 1661, as a law-student at Leipzig, he studied the new methods of logic which were ousting the scholastic theories, and in 1663 he began to study mathematics. Failing to get a degree on account of his youth, he left Leipzig, and obtained employment at Mainz, where he studied alchemy, and became secretary to the Rosicrucians,

whose theories he examined. The danger that befell Germany of invasion by France led to his publishing *Thoughts on Public Safety* (1670), in which he suggested the scheme of France taking Egypt, a scheme which slumbered till revived by Napoleon in 1803. This led to his going to Paris, from which he removed to Amsterdam, and made the acquaintance of Spinoza. He then for many years took charge of the Duke of Brunswick's library at Hanover. From 1712–14 he was at Vienna. He made a calculating-machine, and his investigations in mathematics resulted in the discovery of differential and integral calculus. His chief philosophical works are the *Monadologie* (1714), *Nouveaux Essais* (dialogues on Locke's system), and the *Théodicée* (1710), an attempt to uphold the argument from design in nature. He also wrote much on history and jurisprudence.

Leicester, the county town of Leicestershire, is a municipal, parliamentary, and county borough on the Soar, a tributary of the Trent, 22 miles S.E. of Nottingham, and 20 N.E. of Rugby. It returns two members to Parliament, and has sent two since the time of Edward I. Its central position, its three railways, and facility of water transit, have led to great commercial activity, the great industries being hosiery-making, the manufacture of pegged and riveted boots and shoes, iron-founding, and the manufacture of elastic webbing, sewing-cotton, and lace. There are several good churches, that of St. Martin having a spire 218 feet high, an old town hall with 15th-century carving and glass, municipal buildings, corn exchange, museum, opera house, school of art, and Wyggeston Hospital Schools, originally founded 1513. The Victoria Park, Abbey Public Park, and Spring Hill Park are recreation grounds, and the New Walk is shaded by trees. Leicester is of great antiquity, and is said to be the Roman *Ratae*, many remains of pavements, bricks, urns, etc., having been found. There are traces of the Norman castle, dismantled by Charles I., and the ruined 12th-century Abbey was the place of Wolsey's death. At the Blue Boar Inn Richard III. slept the night before his death. A memorial tower commemorates Simon de Montfort and other worthies, and there is a statue of Robert Hall.

Leicester, ROBERT DUDLEY, EARL OF (1531–88), was the grandson of one of Henry VII.'s agents and extorters. This grandfather was beheaded by Henry VIII., but his son almost succeeded in diverting the succession to the crown at Edward VI.'s death, though his designs led to his own execution and that of his son Guildford. Robert also was committed to the Tower, and was condemned to death, but received the queen's pardon, and was made Master of the Ordnance. He became Master of the Horse to Queen Elizabeth, and the hopes founded on this appointment are said by some to have led to the death in 1560 of the ill-fated Countess Amy, whom Scott has immortalised. He was made K.G., and the queen gave him Kenilworth Castle, where later (1575) she visited him, and lands in Warwick and Wales. In 1564 he was made Earl of Leicester, and in 1578 he married

the widow of the Earl of Essex. In 1585 his expedition to Flushing caused Elizabeth to take offence at the honours paid him by the States-General; but after his recall we find him appointed Lieutenant-General of the army at Tilbury in the last year of his life.

Leighton, FREDERICK, SIR, P.R.A., was born (1830) at Scarborough. He first exhibited at the Royal Academy in 1855 *Cimabue's Madonna carried in Procession at Florence*, and his progress since then has been steady, while he has remained true to his old ideals. His *Paolo and Francesca* and *The Sea giving up her Dead* are well known. Sir Frederick is also a sculptor of merit. He became A.R.A. 1864, P.R.A. and knight 1878, baronet 1886.

Leighton, ROBERT (1822-69), a Scottish poet, was born at Dundee, and spent his early youth on a farm, going from there to his brother's office at Dundee, and sailing in 1842 round the world as a supercargo in one of his brother's ships. He then became traveller for a Liverpool firm. His chief works are *Ye Three Voyces*, *Poems by Robin*, *Baptisement of the Bairn*, *A Laddie's Lamentation*, and *Reuben and other Poems*.

Leinster, the south-eastern of the four provinces into which Ireland is divided.

Leipzig, the second commercial city of Germany, and a great literary and artistic centre, is in a fertile plain of Saxony, above the junction of the Pleisse, Parthe, and Elster, 64 miles N.W. of Dresden, and 6 miles from the Prussian frontier. It consists of the old city, the ancient fortifications of which are now marked by boulevards, and the outlying suburbs and villages. The old town is picturesque in its buildings, among them being the Rathhaus (1556), the Fürstenhaus, the Pleissenburg (16th century), Auerbach's Keller, a wine vault with 16th-century wall-paintings illustrating the story of Faust, the Augusteum (now part of the university), the Paulinum (a monastic building, now the university library), the theatre, and the museum. Leipzig contains the supreme courts of the empire, the second largest university, and is the centre of the book-trade of Germany, the publishers and booksellers having their own clearing-house. One of the chief features of the town is its three great fairs, where business to the amount of £10,000,000 is done, chiefly in furs, leather, hides, wool, cloth, linen, and glass. Beyond perfumery and artificial flower-making, and some founding of type, etc., there are few industries. Leipzig (*lip*, "a lime"), grew into importance in the latter part of the 12th century, and suffered much in the Thirty and the Seven Years' Wars. The last battle fought there was that of 1813 with Napoleon. Leibnitz and Wagner were natives of Leipzig.

Leith, seaport, municipal and parliamentary borough of Scotland, on the south shore of the Firth of Forth, 2 miles N. of Edinburgh, at the mouth of the Water of Leith, and is $3\frac{1}{2}$ miles from E. to W. It is divided into North and South Leith by the water, which is crossed by seven bridges. There are a few fair buildings, and the harbour works have been extensively carried out, there being now

40 acres of docks, seven graving docks, and two piers. Steam communication with London, the North, the Continent, and New York, gives rise to a large export and import trade. The industries are ship-building, sugar-refining, brewing, distilling, etc.

Leitrim, a maritime county in Connaught, between Donegal Bay on the N.W., Fermanagh N.E., Cavan E., Longford S.E., Roscommon and Sligo S.W. It is of an hour-glass shape, and the centre is occupied by Lough Allan. The county is 52 miles long, and contains 588 square miles. In the north is a high tableland reaching to 1,485 feet in Lugnaquilla. The south is wooded and more level. The rivers are the Shannon (flowing S.W. and forming part of the boundary), the Bonnet, Bundrow, and the Bunduff. Other loughs are Maclean, Scur, Gill, and Melvin, and a canal leads from Carrick-on-Shannon to Lough Erne. The central part is in the Connaught coal-field, and ironstone, lead, copper, manganese, and yellow ochre are found; and there are also sulphur and chalybeate springs. Some coarse linens, woollens, and pottery are manufactured. The county returns two members to Parliament, and the capital is Carrick-on-Shannon.

Lek (LAK), a widespread nomad people of West Persia, chiefly in the provinces of Fars and Mazanderan, and in Kasvin district, traditionally descended from the Kaianian Persian dynasty, but really a branch of the Luri (Kurdish) race. All are Mohammedans, though the so-called Nasari form a distinct sect, which rejects the supremacy of the prophet. The famous military bands of the Kelhors and Gurans, at one time commanded by Sir Henry Rawlinson, are Leks, of whom the other chief divisions are the Beiranavands, Khojavands, Nadavands, Nakavands, and Jalilavands, with total population about 110,000.

Leland, JOHN (16th century), English antiquary, was born in London, and was educated at St. Paul's under Lily. He then went to Christ's College, Cambridge, and to All Souls' College, Oxford, and, after a visit to Paris, became chaplain to Henry VIII. The king, in 1530, made him rector of a parish near Calais, and in 1533 appointed him king's antiquary with power of search. For six years he travelled to collect materials, and in 1542 was made rector of Haseley, in Oxfordshire, and the next year Canon of Christ Church and Prebendary of Salisbury. He afterwards went to London, and in 1547 became insane. Most of his collection is in the Bodleian or the British Museum, and later writers have consulted him with advantage.

Lely, PETER, SIR (1617-80), painter, was born in Westphalia. His name Lely is said to be derived from a nickname of his father. After studying two years at Haarlem, he in 1641 came to England, where at first he tried historical subjects and landscapes. He then took to portraits, Charles I. and Cromwell being among his earlier sitters. At the Restoration he was knighted and made State painter. He took for his model Vandyk,

and among his works are the Hampton Court series of *Ladies of Charles II.'s Court*, *Susannah and the Elders*, *Jupiter and Europa*. He also did crayon work. He died and was buried at Covent Garden.

Lemberg, or LÖWENBURG, the capital of the Austrian province of Galicia, is 180 miles E. of Cracow and 60 from the Russian frontier. It is in a hollow 1,000 feet above sea-level on a tributary of the Bug, which flows into the Vistula. The Castle Hill is 1,300 feet high. The site of the old walls is now boulevards, and the suburbs extend over 12 square miles. The Roman Catholics, Greek Catholics, and the Armenians have cathedrals, and there is a Dominican church containing a monument by Thorwaldsen. Besides a university, there is a fine library and good scientific and antiquarian collections. The inhabitants are Poles, Germans, and Ruthenians. Among the productions are flour, beer, vinegar, oil of roses, matches, machinery, and earthenware. Lemberg has often been besieged.

Lemet, a large nation of North Siam, chiefly in the Nam-Ta Valley, left bank of the Mekhong, between lat. 20° and 21° N. They were formerly subject for the most part to the Siamese Governor of Luang-Prabang; but since the rectification of frontiers in 1893 they have passed under French jurisdiction. The language differs greatly from Siamese, and appears to be more nearly allied to Anamese; it is uncultivated, and the Lemets themselves have been little affected by the general Buddhist culture of Indo-China. (Capt. Forbes, *The Languages of Further India*, p. 90.)

Lemnos, in the north of the Ægean Sea, is an island belonging to Turkey, and is about equidistant (40 miles) from Athos and from the Dardanelles. It contains 150 square miles, and much of it is mountainous, though there are fertile valleys, which are cultivated by means of oxen. There are no forests, and wood has to be imported, but the mulberry and other fruit-trees are cultivated, and on the hill-sides thousands of sheep are pastured. The chief productions are corn, wine, and cattle. The archbishop resides at Kastro, which is on the west coast, has a good harbour, and is the seat of trade which is carried on by Greeks, of whom the inhabitants are mostly composed. Another town is Mudros in the south. A peculiarity of Lemnos is a kind of medicinal earth, which is gathered at certain times and in certain quantities with much solemnity. Lemnos was celebrated in Greek history and legend, and was sacred to Hephæstus. After the fall of the Byzantine Empire it belonged to the Turks, Venetians, and again it fell to Turkey in 1657.

Lemming (*Myodes*), a genus of mouse-like Rodents, with four species from Scandinavia, Siberia, and arctic and sub-arctic America. They are allied to the vole (q.v.), but are more stoutly built. The Scandinavian (*M. lemmus*), about 5 inches long, with brownish-yellow fur spotted with black, migrates periodically in vast troops, which go east or west from the central plateau till they reach the sea, into which they plunge with the vain expectation of crossing it, as they have

already crossed the lakes and rivers that lay in their course. The Banded Lemming (*Cuniculus torquatus*), the sole species of the genus, has no external ears.

Lemon (*Citrus Limonum*), a fruit-bearing shrub closely related to the orange (q.v.), apparently truly indigenous in the north of India, carried to Palestine and Egypt by the Arabs, and to Italy by the Crusaders, and now naturalised in the West Indies. The fruit is oval, or ovate, and ends in a nipple-like point; the rind is thin, smooth, and not readily separable; and the juice is acid. There are numerous varieties. Lemons and lemon-juice are imported from Sicily and other parts of southern Europe, the fruits being in cases 4 feet long and about a foot wide and deep, containing 500 lemons, whilst the juice is in casks. One thousand five hundred lemons yield 26 gallons of raw juice; but it takes 2,500 to yield that quantity of concentrated juice. Five per cent. of alcohol may be added as a preservative. Besides their use fresh and candied and in making lemonade, lemons are used in the manufacture of citric acid.

Lemon, ESSENCE OF, is obtained from the rind of lemons, either by pressure or by distillation with water. It consists chiefly of a hydrocarbon of the same composition as oil of turpentine. It possesses an agreeable odour, and is used sometimes for imparting this odour to ointments, medicines, etc.

Lemon, SALTS OF, also called *salts of sorrel*, consist of an acid oxalate of potash, which occurs in the leaves of the wood-sorrel, from which it was formerly largely prepared, chiefly in the neighbourhood of the Black Forest. It forms transparent crystals, soluble in water, and possessing a sour taste. It may be used for taking out rust- or ink-stains from linen and such materials.

Lemonade, a beverage made by digestion of lemons with water and addition of sugar. The commercial lemonade, sold in bottles or siphons, is an aerated water—i.e. water charged under pressure with carbonic acid—sweetened with sugar, and flavoured either by the lemon juice, or by a little citric acid.

Lemur (Lat. = "a ghost"), a Linnæan genus of Primates, named from their nocturnal habits and the weird appearance of some of the species. The term is now applied to the type-genus, and popularly to any member of the sub-order Lemuroidea, some of which show affinities to the Insectivora (q.v.), as well as to the monkeys. Hence, the Germans call them *Halb-affen* (= "half-apes"), and some naturalists Prosimiæ. They are monkey-like animals of small size—mostly nocturnal and arboreal—feeding on fruits, varied with insects, birds' eggs, and small birds. Those of the type-genus, however, are active, diurnal, of gentle disposition, easily tamed, and amusing and affectionate pets. The geographical range of the group, from Malaysia to Madagascar and Africa, has led some naturalists to think that at one time there must have been land connection between these points, and for this hypothetical land Dr. Sclater proposed the name "Lemuria." This theory may probably

assume fresh importance owing to the paper read by Mr. H. O. Forbes before the Royal Geographical Society in March, 1893, as to a supposed former southern continent ("Antarctica"), which, he believes, included Lemuria. [AYE-AYE, GALAGO, LORIS, TARSIER.]

Lemures, in Roman mythology the spirits of the departed. The good were supposed to become Lares (q.v.) and wicked Larvæ, with power to injure the living. On the nights of May 9, 11, and 13 ceremonies were performed to propitiate the Lemures or to check their power.

Lemuria. [LEMUR.]

Lencas, a large group of aborigines occupying parts of the Mosquito territory and Honduras, Central America. At present the term Lenca is applied indifferently to all the Honduras Indians, and thus comprises several tribes, such as the Toacas and Xicacs, who speak quite distinct languages. But all resemble each other in their physical traits, low stature, thick-set frames, robust constitution, and extraordinary staying power as carriers of heavy loads. The Xicacs are still in the wild state; but most of the others are Ladinos, semi-civilised half-breeds, claiming to be Catholics, though still practising many pagan rites and preserving their old patriarchal customs. The Payas (Poyas) of the Rio Negro and about Cape Cameron still dwell in huge barracks, 60 to 80 feet long by 30 feet deep, in which many families have each their own chambers all under one roof.

Lenclos, NIXON DE (1615-1705), a celebrated French beauty, courtesan, and leader of society. The daughter of a gentleman of Touraine, she early began a life of licentiousness, and was a very general lover. As a society leader she was courted by Molière, La Rochefoucauld, Scarron, and others, and Christina of Sweden visited her. She long preserved her beauty, and there is a story that her grandson fell in love with her.

Lenguas, an Indian nation of Gran Chaco, South America, between the rivers Pilcomayo and Paraguay about the Bolivian and Paraguayan frontiers. The Lenguas, *i.e.* "Tongues," are so called by the Spaniards from the little tongue-shaped wooden or bone ornament which they insert in the lower lip, and which is worn in the same way as the wooden disk of the Brazilian Botocudos. They are a branch of the widespread Payagua-Guaycuru family, the true national name being *guiadge*. Formerly very powerful, this fine race of aborigines has been nearly exterminated during their long wars with the settled Hispano-American populations.

Lenni Lenâpe. [DELAWARE INDIANS.]

Lenormant, FRANÇOIS (1837-83), a French scholar and archæologist, was born at Paris, and in 1874 became Professor of Archæology at the *Bibliothèque Nationale*. He explored in Greece and Magna Græcia, discovered the Accadian element in the cuneiform inscriptions of Assyria, and made extensive researches in numismatics, the histories of the Bible, Egypt, and Assyria, and in

comparative philology. Among his works is one on the *Origines de l'Histoire d'après la Bible*. His early death was partly due to overwork, and partly to a wound received during the siege of Paris.

Lens is a part of any refracting substance, bounded by the surfaces of revolution, which are usually spherical. If the radius of a surface is infinite, that surface becomes plane. When a ray of light passes through a lens it is bent towards the thickest part; hence in convex lenses (which are thicker in the middle) the ray is made more convergent, and in concave lenses (which are thicker at the edges) the ray becomes more divergent. Convex or converging lenses may be either (1) double convex, formed by the intersection of two spheres whose centres are on opposite sides of the section; (2) plano-convex, formed by the intersection of a sphere and plane, really a particular case of (1) when one radius is infinite; (3) concavo-convex, formed by the intersection of two spheres whose centres are both on the same side. Concave or diverging lenses are also of three kinds:—(1) Double concave, being that portion of a medium which would be left between two spheres not cutting each other, their centres being on opposite sides of the lens; (2) plano-concave—the part between a non-intersecting sphere and plane; (3) convexo-concave, the part between two non-intersecting spheres, whose centres are on the same side, it being seen that the radius of the concave side must be not greater than the radius of the convex side. The axis of the lens is the axis of revolution, for both the surfaces and the centre of the lens is a point on this axis, such that when any refracted ray passes through it the incident and emergent rays are parallel. Light, incident upon a lens from any point P, is refracted to another point Q, such that the line P Q passes through the centre of the lens, and these two points are called conjugate foci. If P is at infinity, *i.e.* the incident rays are parallel, the point Q moves to a point F, which is called the *principal focus* of the lens, and the distance of F from the centre of the lens is called its *focal length*. The following equations show the relationships between the contents and variables of any lens, when its thickness is neglected:—

$$(1) \quad \frac{1}{r} - \frac{1}{u} = \frac{1}{f}$$

$$(2) \quad \frac{1}{r} - \frac{1}{u} = (\mu - 1) \left(\frac{1}{r} - \frac{1}{s} \right).$$

If O is the centre of the lens, then $u = OP$, $r = OQ$, $f = OF$, μ is the refractive index of the material of the lens, r is the radius of the surface which the incident light first meets, s is the radius of the second surface. Those lines are regarded as positive which are measured in a direction opposite to that of the incident light. The focal length is positive for concave, and negative for convex lenses. If a luminous object be placed at P an image of it will be formed at Q, and this image will be greater or smaller than the object, erect or inverted, according to the position of P. When the rays of light actually pass through the image, it is real and can be received upon a screen, but

when the rays do not actually pass through it, but only appear to come from it, that image is virtual and cannot be received upon a screen. With a concave lens the image is virtual, erect, smaller than, and on the same side of the lens as the object. oq is always less than op . With a convex lens a real inverted image is formed when the distance of the object from the lens is greater than the focal length, the image being smaller or larger than the object, according as the distance of the object is greater or less than twice the focal length; but a virtual, erect, and magnified image is formed when the distance of the object from the lens is less than the focal length; this is the case when a convex lens is used as an ordinary magnifying-glass. When the thickness of the lens is considered, the above formulæ become more complicated, and it is to be noted that in all simple treatment of lenses only those rays must be considered which are incident at, or near, the centre. The rays passing through the lens far from the centre do not converge to the same focus, and so spherical *aberration* occurs. When it is desired to obtain a very clear image of any object—as in photography—it is customary to prevent the entrance of rays near the edge of the lens by means of a stop, which only allows the ones nearly central to pass through. Since light of different wave-lengths is not refracted equally, an object viewed through a single lens appears coloured at the edges. This phenomenon is known as *chromatic aberration*, and was a great difficulty in the use of telescopes and other optical instruments, since definition was impossible. Newton considered the difficulty insurmountable, and this led him to use reflecting telescopes; but Hall discovered that it was possible to combine two or more lenses so that the chromatic aberration is almost completely eliminated. Such combinations or "*achromatic*" lenses are now used even in the cheapest optical instruments.

Lent (Anglo-Saxon = spring), a season of fasting and prayer extending over the forty weekdays which precede Easter. The early Christians observed a fast which lasted from the afternoon of Good Friday to the morning of Easter Day, and was hence known as *Quadragesima*, its duration being about 40 hours. Gradually other days were added, the number of which varied considerably in different churches, as also did the degree of severity with which the fast was kept. It was not till the pontificate of Gregory the Great that its length became fixed at forty days. The name "Quadragesimal Fast" probably contributed to this result, as well as the fact that this was the length of Our Lord's sojourn in the wilderness and of the period of probation imposed on Moses, Elijah, and others in the Old Testament. The Church of England now countenances considerable laxity in the observance of this fast.

Lenticel, a small lens-shaped gland on the under surface of a leaf.

Lentil (*Errum lens*), a leguminous plant, closely related to the genus *Vicia*, the vetches, from which it differs chiefly in the narrow and nearly equal sepals in its calyx. It grows about

18 inches high, with a weak stem, climbing by means of the tendrils which terminate its pinnate leaves. These leaves have eight to twelve leaflets: the flowers are pale blue, and generally in pairs; and the pods are almost square, smooth, and one- or two-seeded. The chief varieties in cultivation are the *French*, in which the seeds are ash-grey, large and flat, and the *Egyptian*, in which they are smaller, rounder, darker outside and orange-coloured inside. The lentil was probably one of the first plants brought under cultivation (Genesis xxv.), and is still largely grown in the East, in Egypt, and in Southern and Central Europe. Considerable quantities are imported into England, chiefly from Egypt, for the manufacture of *Revalenta*, which is little more than lentil meal. The plant might, however, well be cultivated with us, its value as a nitrogenous food being very great. It contains 26 per cent. of albuminoid matter to 35 of starch, 7 of gum, 2 of sugar, 2 of fat, 12.5 of woody fibre, 1.5 of mineral matter, and 14 per cent. of water. If boiled for twenty minutes in soup or beef-tea they have a mildly aperient or deobstruent action, which is most efficacious in many cases of indigestion.

Lenz's Law defines the direction of the current induced in a conductor by the relative motion of that conductor and a magnetic field, and states that the induced current is always in such a direction that its electro-magnetic reaction on the field in which the conductor is moved tends to oppose the motion which produces it.

Leo, the name of 13 Popes of Rome, of which the following are the chief:—**LEO I.**, called "the Great," born towards the end of the 4th century, probably at Rome. In 440, when mediating between Aëtius and Albinus in Gaul, he was elected Pope, and occupied the Papal throne till his death in 461. When Attila invaded Italy in 452 Leo persuaded him to turn back, and four years later induced Genseric the Vandal to moderate the outrages of his troops when they took Rome. **LEO III.**, Pope from 795 to 816. In 799 an attempt made to depose him by the nephews of his predecessor, Adrian I., compelled him to flee to Spoleto, and subsequently to invoke the aid of Charlemagne. The latter, having acted as a judge in the case, acquitted him, and while the Frank Emperor lived Leo was at peace. A year after the trial, in 800, Charlemagne was crowned by the Pope at Rome, and the Holy Roman Empire was founded. Leo, however, contested with his successor the temporal sovereignty of Rome. **LEO X.** (**GIOVANNI DE' MEDICI**), born at Florence in 1475. In 1513, when his family were restored to Florence, he was elected Pope. He defeated a French invasion at the outset of his pontificate by the employment of Swiss troops, but after the battle of Marignano (1515) was obliged to submit to the loss of Parma and Piacenza. He took sides with Charles V. against Francis I., and on the expulsion of the French from Milan in 1521 recovered the lost duchies. He had also gained possession of Urbino, and had further magnificent projects in view when he died suddenly, it was thought by

some, of poison. LEO XIII. He acquired great distinction in many departments of knowledge, notably in philosophy, and in his later years became distinguished as a Latin poet. He was appointed in 1837 Referendary of the Segnatura, and while apostolic delegate at Benevento in the succeeding years he put down brigandage with a high hand. At the close of 1873 he became a cardinal, and in the later years of Pius IX. exercised a predominant control in matters of Papal policy. In 1877 he was appointed "Cardinal Camerlengo of the Holy Roman Church," and in the following year was chosen as successor to Pius IX. in the Papal chair. He reversed the ultramontane policy of the latter, and greatly improved the relations of the Papacy with Germany and France, being chosen as arbitrator in a dispute between Spain and the former in 1885, and in 1892 giving his sanction to the Republican Government. He declined to recognise the Italian Government in Rome, refused the vote of an income, and frequently protested against the law of guarantees and all forms of liberal education. At the same time he put forward the claims of the Papacy to intervene in the Socialistic question, and supported Lavignerie in his crusade against African slavery.

Leonardo da Vinci (1452-1519) was the natural son of the Florentine notary, Ser Piero Antonio da Vinci. He was placed by his father in the studio of Verrocchio, and painted the chief figures in that master's picture of the *Baptism*, now in the Florence Academy. In 1478 Leonardo received his first commission. During this period he was encouraged by Lorenzo de' Medici, and besides numerous records of his other work at this time, there exist studies in the Uffizi and Vatican galleries for an *Adoration of the Magi*, and a *St. Jerome*. About 1482 he took service as an engineer with the Sultan of "Babylon," that is, Cairo, and visited Armenia, Cyprus, Constantinople, and Egypt. Leonardo's two great works during his first residence at Milan, whither he returned, were the erection of a bronze statue to Francesco Sforza, and the painting of his *Last Supper*. The *Last Supper*, which ranks as one of the finest pictures of the world, was painted in oil on the refectory wall of the convent of Santa Maria delle Grazie, at Milan, at the joint expense of the Duke and the Prior. Besides being engaged upon these and minor works, Leonardo was at the head of an academy of arts and sciences, and was studying natural philosophy, geometry, and optics. Early in 1500, or before, he went to Venice, but in the following year became attached to Cæsar Borgia, for whom he travelled as engineer over the greater part of Italy. In 1503 he again settled at Florence, where he was commissioned to paint an altar-piece at Santa Maria dell' Annunziata. The painting was carried out by Filippino Lippi and Perugino. He also began, for the Hall of Council at Florence, *The Battle of Anghian*, but after several years' work abandoned it. Between 1500 and 1505 two great portraits were painted, one, that of Ginevra Benci, now lost, and the *Monna Lisa*, now in the Louvre. In 1506 Leonardo returned to Milan,

where he lived for the next nine years. The two *Virgins of the Rocks*, one of which is in the National Gallery, belong, however, to this period, as also does the *Holy Family* in the Louvre. In the autumn of 1514 Leonardo went to Rome, where the brother of his earliest patron was now Pope. He returned to Milan after a few months, and, after it had fallen to the French, was induced by Francis to return with him across the Alps. Accompanied by Francesco Melzi, he arrived at the Château Cloux, near Amboise, which had been assigned him, and here, after living three years, he died in 1519. Although no more than ten of his undoubted pictures remain, Leonardo da Vinci ranks with his rival Michelangelo and the younger Raffaele, whom he inspired. His drawing, which he did with his left hand (he wrote from right to left), is second only to that of Dürer. In the region of science Leonardo was only less great than in that of art. He discovered the construction of the eye, invented the camera-obscura and the saw which is still used in the quarries of Carrara, revived the science of hydraulics, and was the founder of the structural classification of plants.

Leonidas I., King of Sparta, son of Anaxandrides and 17th of the Agid kings, succeeded his half-brother, Cleomenes I., about 491 B.C. He was given the command of the force which was to make a stand at the pass of Thermopylæ against the army of Xerxes in 480 B.C. Herodotus says that this force consisted of 5,000 men, of whom 300 were picked Spartans. It was through the influence of Leonidas that this line of defence was not abandoned, and even when it was known that information had been given to the Persians which enabled them to turn it he refused to desert his post. He fell early in the fight, but his body was rescued after a sharp struggle.

Leopard (*Felis pardus*), one of the larger cats, ranging over the whole of the south of Asia, Ceylon, Java, Sumatra, and Borneo, and the African continent. The name has superseded that of Pard or Panther, now practically obsolete. Leopards vary greatly, and some authorities have thought that there are more species than one. They are exceedingly active and graceful in their movements, and can climb trees readily. Their favourite haunts are bushy and wooded ground; and their prey consists of deer, antelopes, sheep, goats, pigs, and it is said that they have a special fondness for the flesh of dogs. As a general rule they rarely attack man, but children and old women are often carried off by them; and, like tigers, some develop "man-eating" propensities. The average length is from 6 feet to 7 feet, of which the tail is rather less than half. The fur is pale fawn or reddish-buff, with dark rosettes; the under surface is white with dark spots, and the tail is marked with incomplete rings.

Leopardi, GIACOMO (1798-1837), was born near Ancona. His father was a scholar, and the son, making use of his large library, became a fine classical scholar before he was out of his teens. At eighteen he wrote a long poem, which

was succeeded in 1819 by his *Ode to Italy* and the *Ode on the Monument of Dante*. In 1822 he went to Rome, his father's wish being that he should take Orders, but he soon developed sceptical views, and returned after a year. For three years he continued at Recanati, and produced several lyrics, but in 1825 he went to Bologna in order to edit Cicero and Petrarch for a Milan publisher. Here he published in 1827 his *Operette Morali*. After living for a time at Florence, Milan, and Pisa, he was driven by stress of circumstances back to Recanati. In 1831 he escaped to Florence, where some more poems, including *The Resurrection* and *The Song of the Wandering Shepherd in Asia*, were published. He left Florence for Rome in consequence of disappointment in love, but returned after some months. Having made the acquaintance of a Neapolitan named Ranieri, he accompanied him to Naples, where he composed *La Ginestra*, and *The Sequel to the Battle of the Frogs and Mice*, a satire on the attempted Neapolitan revolution of 1820. An account of his last years at Naples is given in Ranieri's *Sette Anni di Sodalizio*. He died somewhat suddenly in 1837.

Leopold I., King of the Belgians, Prince of Saxe-Coburg-Gotha, was elected king by a National Congress in 1831, the separation of Belgium from Holland having been proclaimed in the previous year. He was born in 1790, and had married in 1816 the Princess Charlotte of England, who died without children in 1817. In 1830 he had declined the crown of Greece. It was only by the help of England and France that he was able to hold his throne and territory against the Dutch, but in 1833 peace was made. Leopold I. sanctioned the first Continental railway, passed safely through the revolutionary period in the middle of the century, and made treaties of commerce with England in 1851 and with France ten years later. He reigned until 1865, and was succeeded by his son, LEOPOLD II., born in 1835, who has chiefly signalled himself by his colonial enterprise in Western Africa. [BELGIUM, CONGO.]

Lepanto, now called EPAKTO, a town of Greece on the northern shore of the entrance to the Gulf of Corinth. It was anciently called Naupaktos, and was an important Athenian naval station. It passed from the Byzantine Empire to the Venetians, from whom it was taken, after a previous siege had failed, by the Sultan Bajazet II. in 1499. Near it took place the great naval victory of Don John of Austria over the Turks in 1571, in which Cervantes was wounded. The town was united with the Greek kingdom in 1829, and is now the seat of a bishop.

Lepcha, a people of Tibetan stock and speech, who form the substratum of the population in Sikkim and parts of Bhutan, along the southern slopes of the Himalayas. The Lepchas have acquired some degree of culture under Buddhist influences, and have reduced their Tibetan dialect to written form, using for the purpose a peculiar script known as the Kong alphabet. Type distinctly Mongolic, low squat figures (average height 5 feet), flat beardless features, yellowish skin, small hands

and feet, full, broad chest, high muscular development. The Lepchas reject caste, and are specially noted for their omnivorous diet, which includes snails, caterpillars, the tender sprouts of ferns and other wild plants. They still purchase their wives, who do most of the hard work, tend the yaks, swine, and poultry, while the men rock the cradle and keep the Buddhist "prayer-wheel" going. They are a light-hearted, cheerful people, and very friendly to the English, who regard them as excellent fellow-travellers.

Lepidodendron, a genus of fossil club-mosses occurring in Upper Palæozoic rocks from the Old Red Sandstone to the Permian. They attained a large size, being sometimes 100 feet in height. As in some species the bark splits longitudinally there seems to have been some means for secondary thickening in the stem, which possessed a central cylinder of scalariform tracheids and a thick cortex. The branching is dichotomous. The whole surface of the stems is covered with diamond-shaped scars of fallen leaves, each showing one vascular bundle as in living club-mosses (q.v.). The great variation in the shape and size of the scars on branches of different age has led to the description of single species under various names. The spore-bearing cones, known as *Lepidostrobus*, terminate the branches, are 1 to 18 inches long, and consist of overlapping sporophylls with large sporangia on their upper surfaces. They are heterosporous, the microspores being generally grouped in fours, and the macrospores being spherical. They are borne on different parts of the same cone, or perhaps sometimes on distinct cones.

Lepidoptera, an order of insects characterised by the fact that the wings are covered with scales, and including the moths and butterflies. The mouth parts form a tube, coiled when not in use, through which the food (honey) is sucked. There are four similar wings. The members of this group pass through a complete metamorphosis, their larvæ being the common caterpillars, some of which cause great destruction to fruit-trees, etc. The silkworm moths are the only ones of any commercial importance.

Lepidosiren. [MUD-FISH.]

Lepidosteus. [BONY PIKE.]

Lepidus, MARCUS ÆMILIUS, was the colleague of Julius Cæsar in the consulate in 46 B.C., and in his absence supported his interests at Rome. With Antony and Octavian he ruled the Roman world for a brief space (43 to 37 B.C.), having Africa as his province; but he was a "slight unmeritable man," and it was his wealth only which gave him influence. He took the part of Antony against his rival, but Augustus left him his wealth and dignities, and he died in peace in 13 B.C.

Leprosy is a disease which prevailed largely in Europe during the Middle Ages, but which is now practically confined in that continent to certain parts of Norway and Sweden. It is still, however, a formidable malady in India, China, parts of Africa,

Hawaii, and elsewhere. The disease occurs in two form—*tubercular* and *anæsthetic* leprosy. In the former variety little nodules are developed in the skin; these subsequently set up ulceration and much scarring results. In anæsthetic leprosy the nerve-trunks are primarily affected, and numbness, tingling, and wasting of muscles are prominent symptoms. The disease is said to be due to the development within the body of a micro-organism known as the *bacillus lepræ*, which presents many points of resemblance to the tubercle bacillus. Leprosy is practically incurable.

Lepsius, KARL RICHARD (1810–84), the Egyptologist, was the son of a Naumburg magistrate of antiquarian tastes. He studied philology at Leipzig and Göttingen, and at Berlin under Bopp. In 1834 his *Palæography as an Instrument in the Study of Language* gained the Volney prize at the Institute of France. He soon after began to devote himself to his life-study, and as early as 1837 his letter to Rossellini on the hieroglyphic alphabet gave him high rank as an Egyptian scholar. In 1842 he was appointed Professor of Egyptology at Berlin, and by the advice of Bunsen was placed at the head of a scientific expedition to Egypt by the King of Prussia. The results of this were given to the world in his *Monuments of Egypt and Ethiopia* (1849–59), with 900 large plates, and a work on Egyptian chronology. His last work was a Nubian grammar.

Leptostraca, a subdivision of Crustacea, including *Nebalia*, a genus in some respects transitional between the Phyllopoda and the Malacostraca. The most ancient forms of Crustacea known—*e.g.* *Hymenocaris*—which occur in the Cambrian rocks, probably belong here.

Le Sage, ALAIN RENÉ (1668–1747), the author of *Gil Blas*, was born at Sarzeau, near the Breton coast, a few miles S. of Vannes. He was educated by the Jesuits, called to the Parisian bar in 1692, and he married two years later a poor but beautiful girl, Marie Huyard. The turning-point in his life was when the Abbé de Lyon placed his large Spanish library at the young man's disposal and added a pension to support his literary efforts. In the early years of the 18th century Le Sage translated plays of Rojas, Lope de Vega, and Avellaneda's continuation of *Don Quixote*. In 1705 his adaptation of Calderon's *Don César Ursin* was acted at the Court with success; but it was his *Crispin Rival de son Maître*, a farce produced in 1707, which laid the foundation of his reputation. In the latter year also Le Sage's second greatest and his most popular work, *Le Diable Boiteux*, was published. In 1735 he revised it, and left it in its present form. His best play, *Turecaret*, which was a retouching and enlargement of a rejected trifle called *Les Étrennes*, appeared in 1709. It was a satire on contemporary financiers, who met it with an organised opposition. Soon after this Le Sage transferred his services from the Théâtre Français to the Théâtre de la Foire, for which he wrote numerous light comic pieces and operettas. Meanwhile he was also at work upon his masterpiece, the first two parts of which were

published in 1715; a third part appeared in 1724, and the concluding one in 1735. Le Sage spent the last seven years of his life at Boulogne.

Lesbos, an island in the Ægean now known as Mytilene. It lies to the N. of the Gulf of Smyrna, and is included in Asiatic Turkey. Its area is estimated at 676 square miles. In the ancient world it had a high name for its wines, oil, and grain; and it was the home of Alcæus and Sappho the poets, of Pittacus the sage and statesman, and Theophrastus the philosopher. The island is mountainous, and suffers from frequent earthquakes, but enjoys notwithstanding a beautiful climate. Lesbos passed from the Byzantine Empire to the Venetians, and from them to the Turks, but its inhabitants are still Greeks.

Lesghians. [LEZGHI.]

Leslie, or LESLEY, a Scottish family, of whom the following were the most notable members:—ALEXANDER, first Earl of Leven (d. 1661), a soldier of fortune, who served with distinction under Gustavus Adolphus during the Thirty Years' War and, after the latter's death, commanded the Swedish army. He left the Swedish service in 1638, and took command of the Covenanters in Scotland. Charles I. offered £500 for his head, and insisted on his resignation as a condition of peace. In 1640 he again held command of the Scottish army, at the head of which he marched into England. After the conclusion of peace he was created Earl of Leven, and took an oath that he would never more bear arms against Charles. In 1644 he invaded England as "lord general" of the Covenanting army. In 1645, after Naseby, he received Charles I. at Newark, but he was soon after relieved of his command at his own request on account of his old age. He was soon, however, reinstated, and was in nominal command of the army which Cromwell defeated at Dunbar in 1650. Next year he was made prisoner and sent to the Tower of London, but was soon released. DAVID (d. 1682) played an important part at Marston Moor. He defeated Montrose at Philiphaugh, and was the real commander at Dunbar. He was created Lord Newark at the Restoration. JOHN LESLIE, or LESLEY (1527–96), Bishop of Ross, defended Catholicism against Knox at Edinburgh in 1561, and was sent to France by the nobles to bring Mary Stuart back to Scotland. When she arrived he became her chief adviser. After the discovery of the Norfolk conspiracy he was imprisoned in the Tower, and it was on the evidence of his confessions that Norfolk was executed. After his release he went to France and to Rome in Mary's interests, and was at the bottom of all the schemes for her liberation. He spent the rest of his life abroad, and died in a monastery near Brussels.

Leslie, CHARLES ROBERT (1794–1859), a *genre* painter, was the son of a clever clockmaker. He was born in London, but when quite young went back with his father to America. Having attracted attention by a portrait of G. F. Cooke the actor, he was sent by a subscription of merchants to study painting in Europe. While studying at the Academy schools and elsewhere the young man became

intimate with Washington Irving and Constable, and saw something of Coleridge. He painted the portrait of the first, and also illustrated his *Sketchbook* and *Knickerbocker's History of New York*. Leslie's first great success was his *Sir Roger de Coverley going to Church*. In 1821, when he exhibited *May Day Revels in the Time of Elizabeth*, he was elected A.R.A. In 1824 he visited Scott at Abbotsford, and painted his portrait. Two years later he became R.A., his diploma picture being *Queen Katharine and her Maid*. Among the best of his other pictures were *Uncle Toby and the Widow Wadman* (now in the National Gallery), *The Taming of the Shrew*, and *The Dinner at Mrs. Page's House*. His son, GEORGE DUNLOP LESLIE (b. 1835), a graceful painter of homely subjects, was elected R.A. in 1876.

Leslie, SIR JOHN (1766-1832), natural philosopher, was educated at St. Andrews and Edinburgh, his expenses being paid by the Chancellor, Lord Kinnoull. He abandoned the notion of taking Orders, and spent two years as a tutor in Virginia, and from 1790 onwards continued both to take pupils and to prosecute his own scientific researches. In 1793 he translated Buffon's *Natural History of Birds*, and in 1804 obtained the Rumford Medal of the Royal Society for his *Experimental Inquiry into the Nature and Propagation of Heat*. Next year he was appointed mathematical professor at Edinburgh, and held it for fourteen years, exchanging it in 1819 for the chair of natural philosophy. In 1832, the year of his death, he was created a Knight of the Guelphic Order.

Leslie, THOMAS CLIFFE, economist, was born about 1827. He held for some years the chair of economics and law at Belfast, and was one of the earliest adherents of the historical school of economists. His views are set forth in *The Land Systems* (1870), and *Essays in Political and Moral Philosophy* (1879). He died in 1882.

Lespinasse, CLAIRE FRANÇOISE, writer of some famous love-letters, was born about 1731 at Lyons. She died at Paris in 1776. While companion to Madame du Deffand she became attached to D'Alembert. The salon which she afterwards formed was brilliant in the extreme. She fell in love with the Marquis de Moira and M. de Guibert, her letters to whom were first published in 1809. More unpublished letters addressed to Condorcet appeared in 1887.

Lesseps, FERDINAND, VICOMTE DE, was born in 1805. He entered the diplomatic service in 1825, became consul at Cairo in 1833, and at Barcelona in 1842, and in 1848 as French ambassador at Madrid negotiated a postal treaty with Spain. In 1854, after a visit to Saïd Pasha, the then ruler of Egypt, he was invited to explain his scheme for a canal between the Mediterranean and Red Seas, which he did in his *Percement de l'Isthme de Suez Exposé*. The project having been sanctioned in 1856, a company was formed, and the work was begun in 1859, and on November 17, 1869, the Suez Canal was formally opened, representatives of most of the Powers being present. M. Lesseps was rewarded with the Grand Cross of the Legion

of Honour and with several foreign decorations. In 1873 he was made a member of the Académie des Sciences, and three years later was awarded a prize of 5,000 francs for his *Lettres, Journal, et Documents pour Servir à l'Histoire du Suez Canal*, published in 1875. The second great engineering scheme of Lesseps, the attempt to cut through the peninsula of Panama, involved great expense, and ended in ignominious failure. In 1889 the Panama Company went into liquidation, and in 1893 Lesseps, his son, and some others were convicted of corrupting Government officials and sentenced to terms of imprisonment, not carried out in the case of the first.

Lessing, GOTTHOLD EPHRAIM (1729-81), the great German critic and dramatist, was one of the sons of the pastor of Kamenz, Saxony. After five years at the school of St. Afra, at Meissen, he was sent to Leipzig to study theology, but he preferred to continue reading the classical writers, while at the same time he indulged his passion for the drama. At the end of the year 1748 he went to Berlin in order to enter upon a literary career. During his three years' stay he wrote some plays, did some translations, and contributed critical articles to the *Vossische Zeitung*. At the end of 1751 he went to Wittenberg, where he read voraciously and took his degree in arts. After a year spent there he returned to Berlin, and during the next three years laid the foundation of his reputation as a critic by his articles in the *Vossische Zeitung*. With his friend Moses Mendelssohn he also wrote an essay on Pope as a metaphysician. In 1755 his first important play, *Miss Sara Sampson*, was also produced. Its success, when represented at Frankfort-on-the-Oder, induced the author to return to Leipzig. In 1756 he started for a foreign tour with a young merchant named Winkler, but was recalled by the outbreak of the Seven Years' War. After this, except for a nine months' visit to Italy with the Duke of Brunswick in 1775, Lessing was never out of Germany. In 1758 he again went to live at Berlin, and immediately began his important contributions to Nicolai's *Litteraturbriefe*. He also published a collection of fables, with a valuable essay on the nature of this department of literature. From 1760 to 1765 he was at Breslau, acting as secretary to General Tauentzien, the governor. Here he began *Laocöon* and *Minna von Barnhelm* and investigated the early history of Christianity. The two masterpieces just mentioned were published at Berlin in 1766 and 1767 respectively. Lessing, having been refused by Frederick the Great the post of keeper of the Royal Library because Voltaire fancied he had committed some offence against him, left Berlin for Hamburg in 1767. Here he received an appointment in connection with the National theatre, which an attempt was made to establish. The chief works of the Hamburg period (1767-70) were the *Hamburgische Dramaturgie*, a criticism of the plays produced, containing a complete theory of dramatic art, a defence of *Laocöon* against Klotze, and a comparison of ancient and modern views of death (*Wie die Alten den Tod Gebildet*). From

1770 to the end of his life Lessing's residence was at Wolfenbüttel. As librarian to the Duke of Brunswick he had command of a fine library, of which he made ample use. In 1771 he published a work on epigrams, described by Herder as itself an epigram, and in the following year *Emilia Galotti*, a modern play on the lines of the legend of Virginia. Lessing's last years were devoted to the discussion of philosophical and theological matters. In several pamphlets he contended for universal tolerance in religious opinion, and maintained that Christianity rested not upon speculations and researches, but upon its power of adaptation to human wants. Orthodox opinion compelled the Duke of Brunswick to order Lessing to refrain from further controversy; but he made bold to continue it in another form in his last play, *Nathan der Weise* (1779). Lessing was the father of modern German literature. In style he surpassed every German save Goethe and Heine, and in his *Laocöon*, acknowledged to be one of the world's greatest treatises on art, the method is clear and natural.

Lestock, RICHARD, English seaman, was born about 1678, and was posted in 1706. In 1743 he was promoted to be rear-admiral and vice-admiral, while second in command in the Mediterranean. There (1744) he shared in Mathews's unsatisfactory action off Toulon. Mathews suspended him and brought him to a court martial, but Lestock was acquitted, and was in 1746 promoted to be admiral. He died in December.

Letter of Marque, an extraordinary commission by the Lords of the Admiralty or the vice-admiral of a distant province to a commander of a merchant-ship or privateer to cruise against and make prize of an enemy's vessels by way of reparation for damage inflicted by that enemy. Ere such a letter could be granted it was necessary to make oath concerning the damage sustained, to offer proof that legal prosecution had been ineffectual, and to petition the head of the State for justice. Another name for the same commission is **LETTER OF REPRISAL**. The Treaty of Paris (1856) formally abolished all such commissions, but the United States, Spain, and Mexico never adhered to the understanding, which, no doubt, would be disregarded in war time by any Power which might find the treaty opposed to its apparent interests.

Lettres de Cachet, or **LETTRES CLOSES**, letters making known the royal will to individuals or corporations which were used by the kings of France prior to the Revolution. They were so called because they were folded up, and had the king's little seal (*cachet*) impressed upon them. They were often used so as to interfere with the proper administration of justice, and by their means many innocent persons who happened to be obnoxious to the king or his favourites were consigned to the Bastille.

Letts. [LITHUANIANS.]

Lettuce (*Lactuca*), a genus of Compositæ, represented by several British species and one of

unknown origin commonly cultivated as *L. sativa*. It probably came from Asia, and has been grown in England since 1562, Gerard describing eight varieties as early as 1597. It is an annual, with roundish or obovate-obtuse leaves, entire or slightly-toothed, and varying in colour. The flower-stem is erect, branching, and about 3 feet high; the involucre consists of a few overlapping bracts; the receptacle is naked; the florets are all ligulate and pale yellow, and the fruits are flattened and have a stipitate pappus. The cultivated forms are grouped as either *cabbage lettuces*, with compact heads and rounded leaves, or *eos lettuces*, with longer, upright, firmer leaves. They are not nutritious, but pleasantly cooling as salad. When flowering the plant produces more of the milky, bitter, and slightly narcotic sap from which the mild opiate *Lactucarium* is prepared. Venus mourning Adonis is said to have soothed herself on a bed of lettuces; Herodotus mentions them as served at the Persian Court 400 years B.C.; Virgil and Columella recommend them as salad; Augustus is said by Pliny to have been cured of an illness by eating them freely; and Galen is said to have used them as an opiate in the 3rd century A.D.

Leucine is a nitrogenous product occurring in many parts of the human body—*e.g.* the pancreas, spleen, liver, etc. It is usually formed as one of the products of the decay and putrefaction of nitrogenous matter. It forms, when pure, thin, glittering, tasteless, and odourless crystals, which dissolve in hot water, but are far less soluble in cold water or alcohol. It may also be formed by various chemical syntheses, and these, together with its chemical deportment, show the compound to be an α -amido caproic acid, possessing the formula $C_4H_9 \cdot CH(NH_2) \cdot CO_2H$.

Leuciscus, a genus of fishes of the Carp family (*Cyprinidæ*), from the north temperate zone of both hemispheres. Here belong the Chub, the Dace, the Ide, which when domesticated assumes a colouring like that of the Gold-fish, and is then known as the Orf, the Minnow, the Roach, the Rudd, etc.

Leucite, or **WHITE GARNET**, named from the Greek *leukos*, "white," is a silicate of alumina and potash, of considerable interest among volcanic minerals. It occurs in very regular white or grey crystals, sometimes an inch in diameter, having 24 trapezoid faces, the form being known as *leucitoid*. Optical characters show it to belong to the Pyramidal system; but when heated its angles undergo a slight change, and it becomes Cubic. Showers of crystals of leucite as big as peas are sometimes thrown out by Vesuvius; and they occur also in lavas known as *leucitophyres*, one of which near Rome has for centuries been used for millstones.

Leucocythæmia, a disease in which the leucocytes, or white corpuscles of the blood, are largely increased in number; there is often associated enlargement of the spleen and of the lymphatic glands. The disease usually proves fatal, and little is known concerning its causation and treatment.

Leucoma is a term sometimes applied to the white scars left on the cornea of the eye as the result of severe ulceration.

Leucoplastids, the name given to the starch-forming corpuscles found in the protoplasm of vegetable cells.

Leucorrhœa, or "whites," a term applied to the condition in which there is a whitish discharge (that is, a muco-purulent, as opposed to a blood-stained, discharge) from the female organs of generation. Treatment consists in the administration of tonics and the use of an antiseptic or astringent douche.

Levant (Ital. *levante* = "rising"), the name given to the E. part of the Mediterranean and to the shores of Asia Minor, over which to the eye of a European the sun rises. The name "Levanter" is similarly given to a Mediterranean eastern wind.

Levelling, a process in land-surveying for the determination of the variation in level over a given area. The instrument employed is the surveyor's *level*, consisting of a telescope mounted on a tripod stand and arranged so that it can be adjusted accurately horizontal by means of a spirit-level of the ordinary type. If two poles, graduated in feet and inches, are held vertical at two points, one some distance in front of the telescope and the other behind, the readings on them when viewed through the telescope will only be identical when the two points are at the same level. The difference of level will be the difference in their readings. On this principle a series of observations may be taken, which however, require correction for the curvature of the earth when taken over a large area.

Lever, CHARLES JAMES (1806-72), was the second son of James Lever, of Dublin. Both his parents were of English descent. He graduated at Trinity College in 1827, and in the succeeding years travelled in Holland, Germany, and Canada. He then became a surgeon; but, though he had a good practice and had inherited half his father's property, his extravagance compelled him to look for an additional source of income in literature. In 1837 *Harry Lorrequer* began to appear in the *Dublin University Magazine*. Three years later the author went to live at Brussels, but continued to write. In 1840 *Charles O'Malley* appeared in serial form. In 1842 Lever returned to Dublin on an invitation to become editor of the magazine whose fortune he had made. In it *Tom Burke of Ours* came out in 1844, and was followed by *The O'Donoghue* (1845) and *The Knight of Gwynne* (1847). He was visited by Thackeray when on his Irish tour, and the *Irish Sketchbook* was dedicated to Lever. In 1845 he resigned his editorship, and began a wandering life on the Continent. At Florence he wrote *The Dodd Family Abroad* (1854), the last of his novels which had real merit. Later, however, he contributed novels to *Blackwood* and *Cornhill*, and wrote "topical" notes for the former paper signed Cornelius O'Dowd. In 1857 he was appointed consul at Spezia, and ten years later was

transferred to Trieste, where he died. He paid a last visit to Ireland in 1871.

Leverrier, URBAN JEAN JOSEPH (1811-77), the greatest French astronomer of the 19th century, was a native of St. Lô, Normandy. After a brilliant career at the Ecole Polytechnique he obtained some reputation as a chemist, but was induced to transfer his attention to the study of astronomy in 1837 by the offer of the post of teacher at the Polytechnic. He soon attracted the attention of Arago, and in 1843 published *Tables de Mercure*. In 1846 he was elected to the Académie des Sciences, and in the same year, as the result of minute investigations, he indicated the spot where an unknown planet would be found. A few days later Neptune was discovered within a degree of the place. John Couch Adams, of Cambridge, had reached a similar result independently. The Royal Astronomical Society awarded a medal to both astronomers for the discovery, and Leverrier afterwards received the Copley Medal, the Legion of Honour, and many foreign decorations. He also became tutor to the Comte de Paris, and professor in the Faculté des Sciences. In 1849 he entered the Assembly as a Republican, but was opposed to the Socialists. Nevertheless, Napoleon III. made him a senator, and appointed him Inspector-General of Public Instruction. In 1854 he succeeded Arago as director of the Paris Observatory, from which he was obliged to retire in 1870 on account of the outcry which his reforms excited. He was reinstated by Thiers with limited powers in 1873, and devoted the rest of his life to the revision of planetary theories, a comparison of results with observations, and the construction of illustrative tables.

Levers are mechanical devices used for transmitting and altering the direction and magnitude of forces. If a bar can turn on a pivot or fulcrum near one end, and a downward force is applied to the long end, the short end will be raised with a greater force and through a correspondingly smaller distance, as when a crow-bar is used for lifting a heavy body. Call the force applied to one point on the lever P, and the force available at some other point W; then if the fulcrum is between the P and W ends of the lever, W will act in a contrary direction to P, and the magnitude of W will be to the magnitude of P as P's distance from the fulcrum is to W's distance. If W is between the fulcrum and P, or *vice versa*, the two forces will act in the same direction, and their magnitudes will still be precisely proportional to their distances from the fulcrum. A bell-crank lever is bent at right angles, the fulcrum being at the angle, and a force applied at one end is transmitted at right angles to its original direction. In any lever or system of levers, the force applied at one point, multiplied by the distance through which it acts must—neglecting the effects of friction at the pivot and of bending in the lever—be equal to the force developed at any other point multiplied by the distance through which it acts.

Levo, a prefix applied to those optically active compounds which turn the plane of polarisation to the left. [POLARISATION.]

Levulose, also called FRUIT SUGAR and FRUCTOSE, is a member of the sugar group of compounds, and possesses the formula $C_6H_{12}O_6$. It is present in almost all sweet fruits, usually associated with an equal quantity of grape-sugar or dextrose (q.v.). It is formed together with this compound by boiling a solution of cane-sugar for some hours with a dilute acid, the process being known as the inversion of sugar. If inulin (q.v.) be similarly treated, levulose alone results. If extracted thoroughly by alcohol, it may be obtained crystalline, forming needle-like silky crystals. It is soluble in water and alcohol, and in all its chemical reactions it closely resembles dextrose. It differs, however, from this substance in turning the plane of polarised light to the left; in being less easily fermented, being more soluble and yielding different products upon oxidation. This last difference is due to the two compounds possessing different constitutions, grape-sugar belonging to the class of bodies known as *aldehydes* (q.v.), while levulose possesses a constitution which places it among the *ketones* (q.v.). [SUGAR, CARBO-HYDRATES, DEXTROSE.]

Lewald, FANNY (1811–89), German novelist, was born of Jewish parents at Königsberg. In 1840 she went to live at Berlin, where fifteen years later she married Adolf Stahr. Besides many novels, *Von Geschlecht zu Geschlecht*, etc., she wrote books on England and Italy, and an essay on Woman's Rights (*Für und Wider die Frauen*). *Meine Lebensgeschichte* (1861) is an account of part of her own life.

Lewes, the assize town of Sussex, is 10 miles N.E. of Brighton. It is probably of very ancient origin. In late Saxon times there was a mint here, and the town is celebrated in later times as giving its name to the victory of Simon de Montfort in 1264. There are only slight remains of the castle and priory. Some of the seven churches are, however, of interest. The grammar school was founded in 1512, but most of the buildings are of very recent date. Race-meetings are held three times a year near the site of the battle. The town was incorporated in 1881, and disfranchised by the third Reform Bill. Its chief industries are the corn and malt trade and tanning.

Lewes, GEORGE HENRY (1817–78), a versatile writer on philosophy, science, and the drama, was born in London, and educated there and in France. He was first in a notary's office; then in the employment of a Russian merchant; next studied medicine, but was disgusted by his hospital experiences, and in 1838 went to Germany. After his return he several times appeared on the stage; but, though he had talent, he was without the necessary physical qualities. After his marriage he entered upon a literary career, writing at first chiefly upon dramatic subjects, in the quarterly reviews. In 1850 his play *The Noble Heart* was produced, he himself taking a part. In 1845–46 appeared his *Biographical History of Philosophy* in 4 vols., and in 1853 *Comte's Philosophy of the Sciences*. In 1851 he first made the acquaintance of Mary Ann Evans (George Eliot) (q.v.), with whom three

years later he went to Germany. His *Life of Goethe* appeared soon after their return. He now began to give much attention to scientific studies, and published in 1859 *The Physiology of Common Life*, in 1862 *Studies in Animal Life*, and in 1864 a book respecting Aristotle's scientific anticipations. In 1865 he became first editor of the *Fortnightly Review*, but soon resigned the position to Mr. John Morley. His last important work, *Problems of Life and Mind*, was begun in 1873, but the last volume did not appear until after his death.

Lewis, SIR GEORGE CORNEWALL (1806–63), a statesman and political writer, was born in London and educated at Eton and Oxford, and was created D.C.L. in 1857. He was called to the bar in 1831, but practised very little. In 1847 he entered Parliament as a Whig, and was soon after appointed one of the Secretaries to the Board of Control. Next year he became Under-Secretary for the Home Department, and was from 1850 to 1852 Financial Secretary to the Treasury. On the resignation of Mr. Gladstone he became Chancellor of the Exchequer, and as such carried the Newspaper Stamps Bill through the House of Commons. In Lord Palmerston's second Ministry he was Home Secretary at first, and afterwards Secretary for War. He died while holding the latter office. His writings are of high merit, and exhibit great versatility. His *Credibility of Early Roman History* is incidentally a valuable treatise on historical evidence. He also wrote *inter alia* several works on political science.

Lewis, MATTHEW GREGORY (1775–1818), "Monk Lewis," was born in London and educated at Westminster and Christ Church, and in 1792 met Goethe at Weimar. Two years later he became an *attaché* at the Hague, where *Ambrosio, or the Monk*, was written. It was highly popular, but had to be expurgated under threat of a public prosecution. Lewis sat in Parliament from 1796 to 1802, saw the best society, and wrote plays and poems, his *Castle Spectre*, produced at Drury Lane in 1798, being the most successful. In that year he first met Sir Walter Scott. He died of yellow fever in 1818.

Lexington. (1) A village, eleven miles N.W. of Boston, where, on April 10, 1775, the skirmish took place which begun the American Revolution. There is a monument to commemorate those who fell. (2) A town in Kentucky, a few miles S.E. of Frankfort, is the capital of Fayette county. It is the junction for four railways, and contains the State University, Agricultural College, and lunatic asylums. It was founded in the first year of the Revolution: hence its name. (3) A village in Virginia, the capital of Rockbridge county, where is the Washington and Lee University, founded in 1749, and the Virginia Military Institute. "Stonewall" Jackson and Robert Lee were buried here. (4) The capital of Lafayette county, Missouri.

Leyden, one of the chief towns of Holland, stands on the Rhine a few miles from its mouth, about midway between Haarlem and Rotterdam,

and 15 miles N.W. of the Hague. In the Middle Ages it was celebrated for its cloth manufacture, but saw troublous times, being six times during the 15th century besieged by the "Hooks." During the War of Independence it held out from October, 1573, to the same month in 1574; and the inhabitants were rewarded for their heroism by the establishment of a university which was to take a high place in the learned world. Medicine and law have perhaps been its most prominent faculties, but theology and classical learning also had their place. Amongst alumni and professors have been Grotius, Descartes, Scaliger, Salmasius, Sir Thomas Browne, Alexander Monro, and recently Kuenen and Cobet; while Linnæus and Boerhaave have been among the directors of the celebrated botanic gardens. The university possesses a fine collection of Greek and Oriental MSS., a fine natural history museum, a museum of antiquities especially rich in its Egyptian department, and an ethnographical museum containing Von Siebold's Japanese collection. It has now somewhat diminished in importance, but has still fifty professors and some 800 students. Rembrandt, Jan van Steen and Gerard Douw were natives of the places, as also were some of the Elzevirs. The "Burg," a round wall resting upon arches on a mound in the centre of the town, is said to be of Roman origin; the town hall dates from the 16th century. The church of St. Pancratius has a monument to Van der Werf, the hero of the siege, and that of St. Peter contains memorials of Scaliger, Arminius, and Boerhaave. The chief modern institution of Leyden is its school of navigation. An open space on the south of the town commemorates by its name, "The Ruin," an explosion by which in 1807 a large part of Leyden was destroyed. After the seventeenth century its population and trade began to decline, and they have never since materially increased.

Leyden Jar is a particular form of electrical condenser (q.v.). A glass jar is coated on its lower half inside and outside with tin-foil, the lip and upper half being varnished to improve the insulation. Sometimes the jar is partly filled with strong sulphuric acid, which replaces the foil as the inner conductor, and keeps the interior surface of the glass dry by absorbing moisture. A rod terminating in a brass knob is usually fixed to a wooden stopper and connected to the inner coating. The capacity of a Leyden jar is small, but the dielectric strength of the glass is considerable, so that, by charging the jar with an influence machine until a very great difference of potential exists between the two coatings, discharges of considerable vigour may be obtained.

Leyden, JOHN (1775-1811), a Scotch physician and poet, was born at Denholm, Roxburghshire, and distinguished himself as a scholar of Edinburgh University. He studied Oriental and modern languages, and made the acquaintance of Sydney Smith, Brougham and Jeffrey, at the University Literary Society. In 1799 he published *A Historical and Philosophical Sketch of European Discoveries in Northern and Western Africa at the End of the*

18th Century, edited for Constable the *Complaynt of Scotland*, and helped Scott with the earlier volumes of his *Border Minstrelsy*. He also edited for a time the *Scots' Magazine*, and wrote some lyrics of some merit. In 1803 he went out to Madras to take the appointment of assistant-surgeon and made a report on the diseases, the crops, and the languages of Mysore. In 1805 he went to Penang for his health, and soon after his return was made Professor of Hindustani at Calcutta. In 1809 he was appointed to judicial office by Lord Minto, and in 1811 went with him to Java as Malay interpreter, but died of fever soon after his arrival.

Leys, HENRI JEAN AUGUSTE, BARON (1815-69), a Belgian painter, was born and lived at Antwerp. He was ennobled by Leopold I. in 1862. Of his pictures, which are after the old Flemish style, the best were *Rembrandt's Studio*, *A Flemish Wedding*, *Luther Singing in the Streets of Eisenach*, and *Erasmus in his Study*. Antwerp townhouse is decorated by a series of scenes from its history from his hand.

Lezghi (LEZGHIAN, LESGHIAN), collective name of the east Daghestan tribes, Caucasus; Lekhi, the Georgian form, is applied by their southern neighbours to all the Daghestan peoples—Avars, Kazikumuks, Akashas, Kurines, Udes, etc., who differ greatly in speech, but closely resemble one another in their physical features. "A fine handsome race, well built, with black eyes and hair, but smaller in stature than the Georgians" (Monteith). There are altogether over fifty distinct Lezghian tribes, all of whom are Mohammedans except the Dido of the Andi district, whom their neighbours call Devil-worshippers. The Avars, who are the most numerous and renowned of all the Lezghians, comprising nearly one-fifth of the whole nation, are by most historians regarded as akin to the mediæval Avars, who founded an empire on the Danube overthrown by Charlemagne. But those Avars were certainly of Mongolic stock and speech, whereas all the Lezghians are of true Caucasian type, and speak extremely harsh languages, showing no kind of affinity with the Mongolo-Tartar linguistic family. Some of the dialects have an unpronounceable click, which occurs both in the beginning, the middle, and the end of words. Total Lezghian population, 707,000, of whom 155,000 belong to the Avar group.

Lhasa (LHA-SA, "God's Seat,") the capital of Thibet, stands in the middle of an elevated plain more than 11,000 feet above the sea-level, in lat. 29° 39' N. and long. 90° 57' E., according to Nain Singh. The river Ki-chu flows past the south of the city, which is surrounded by a wall with barren hills in the background. Outside are large suburbs, in which many of the houses are built of sheep and goats' horns set in clay. Lhasa is the centre of the Buddhist religion. The Grand Lama (Dalai Lama), the civil and ecclesiastical ruler, under the Chinese, of Thibet, lives in the Potala, a hill on the N.W. of the city crowded with temples and palaces. The temple of Labrang contains a life-size image

of the Buddha and other holy persons, to whose shrines pilgrims come from all parts of Asia. Two other temples are those of Ramo Cuhé and Moru. There are numerous monasteries in the country round Lhasa, those of the Foui Ling, Dai-pung, and the Galdan Lamaserai, whose abbot is a great dignitary, being the chief. Lhasa is the centre of the caravan trade of Asia. Large quantities of tea are imported from China; for it are exchanged Thibetan wool-stuffs, earthenware, and pastille-sticks, which are made by the inhabitants. Much of the trade is in the hands of the Kashmiris, who are Mohammedans. Beside some Chinese, the inhabitants include not a few immigrants from Nepal and Bhotan, who are skilful metal-workers. The Lhasa women have a curious custom of staining their faces with black nnguent; they go about freely, and do much of the retail trade.

Lhopa, a wild tribe of the eastern Himalayas, in Bhutan, towards the frontiers of Bengal. The Lhopa, *i.e.* "Southerners," in reference to Tibet, are also called *Lho-kha-Chra*, *i.e.* "Tattooed People of the South." They are of Tibetan stock, showing affinities to the neighbouring Avars and Mechi, with whom they are often grouped.

L'Hôpital, MICHEL DE (d. 1573), a great French statesman, was born in 1504 or 1505. He studied at Toulouse and Padua, and after the death of Charles de Bourbon, his patron, to whom his father was physician and comptroller, became auditor of the Rota at Rome. In 1534 he returned to France, entered at the Parisian bar, and obtained by his marriage the post of counsellor to the Parlement in 1537. From 1560 to 1568 L'Hôpital was Chancellor of France. He advised the registration by the Parlement of the edict of Romorantin, protecting heretics against the Inquisition, prevailed upon the Council to summon the States-General in 1560, and promoted the conference of Poissy. In 1563 he underwent a temporary disgrace; but in the same year Charles IX. was declared of age by his advice, to which also was due the refusal of the Parlement to sanction the acts of the Council of Trent as contrary to Gallican liberties. His last years were spent in literary retirement.

Li (LOI, LI-TSI), the aborigines of the large island of Hainan, off the south coast of China, now mainly confined to the central districts. There are two social groups: *Shuh-Li*, *i.e.* "Ripe" or "Baked," Li, meaning civilised or settled; and *Song-Li*, *i.e.* "Raw" Li, in the sense of wild, savage or unreduced. Some of the latter fully deserve their name, going naked, tilling no land, living on wild fruits, vermin, and roots, dwelling in caves or rocky recesses of the upland valleys. The "Ripe," on the other hand, have long maintained friendly relations with the Chinese settlers on the coastlands, with whom they are being gradually assimilated.

Liability of Employers. [MASTER AND SERVANT.]

Lias, said to be so named from a provincial pronunciation of "layers," from its well-marked stratification, is the lowermost division of the

English Jurassic system (q.v.). It extends continuously from Dorsetshire to the mouth of the Tees, outlying patches occurring at Carlisle, in Skye and the west of Scotland, and under the Chalk escarpment in the north of Ireland. It consists of three divisions: the *Lower*, dark shales, with thin blue and brown nodular bands of limestone; the *Middle* or *Marlstone*, argillaceous limestone, with micaceous sands and clays, and the "black band ironstone," 15 to 20 feet thick, of the Cleveland district in Yorkshire; and the *Upper*, blue clays and shales, with septarian nodules. It passes, by sandy passage-beds, conformably into the beds both above it and below. Its fossil plants comprise *Equisetites*, ferns, cycads, and conifers (*Cupressus*, *Pinites*, etc.), whilst numerous insect-remains, including wood-boring beetles, dragon-flies, and others, also point to the proximity of land. The shallow-water marine life is abundantly preserved, including corals; such crinoids as *Extraerinus*; starfish; sea-urchins; numerous brachiopods, especially *Rhynchonella* and *Spiriferina*, the last of its family; still more pelecypods, especially scallops (*Pecten*), *Lima* and *Gryphæa*; and many gastropods, such as *Cerithium*, *Turbo*, *Trochus*, and *Pleurotomaria*. The most characteristic molluscs, however, are the cephalopods, including species of *Nautilus*, 60 species of *Belemnites*, and upwards of 130 of the *Ammonitidæ*. Many of these last have a small vertical range, but occur on the same relative horizons over most of western Europe, so that the whole formation is subdivided into zones (q.v.) named after the various species of this group. Fish are numerous, including the teeth (*Acerodus*, *Ceratodus*) and spines of placoids and whole ganoids, such as *Lepidotus*; but the large reptiles, such as *Ichthyosaurus* and *Plesiosaurus*, are so characteristic that the period has been termed the "age of reptiles." The Lias, or *Brown Jura*, of Germany much resembles that of England. Its upper member yields paraffin shale. In France and Switzerland the Lias is subdivided into four:—

Toarcien	= Upper Lias.
Liassien	= Middle Lias.
Sinemurien	= Lower Lias.
Hettangian	= Infra-Lias.

Libanius, the ablest Greek writer of the 4th century A.D., was born near Antioch about 315. His popularity as a teacher at Constantinople led to his expulsion in 346 on a charge of studying magic. He now passed five years in Nicomedia, and, after again spending some years in Constantinople, retired to his native place in 354, and died there in the last year of the century. Though a pagan, he was favoured by the Christian emperors, and was the teacher of St. Chrysostom and St. Basil.

Libau, a Baltic port of Russia, some 140 miles W.S.W. of Riga. It has a fine harbour for purposes of trade, and a first-class naval harbour has been recently constructed. From this port are shipped large cargoes of grain, petroleum, linseed, eggs, and oil-cake; and the imports, chiefly British, are coal, cotton, iron, and herrings. The chief industries of the town are iron-founding and brewing, and there is a school of navigation. The population is chiefly

German. The organ in Trinity church is one of the largest in the world.

Libel (from the Latin *libellus*, "a little book") is a malicious defamation expressed either in writing, or by signs, pictures, etc., tending either to blacken the memory of one who is dead or the reputation of one who is alive, and thereby exposing him to public hatred, contempt, or ridicule. In other words, it is *written slander*, and it is generally treated as a more serious mode of defamation than slander. [SLANDER.] Whatever written words tend to render anyone ridiculous or to lower him or her in the estimation of the world is a libel, although the very same expressions if spoken might not have been slander or defamation in the legal sense of those terms. To complete the offence publication is necessary, that is, the communication of the libel to some person, either the person libelled or some other. The mere writing of defamatory matter without publication is not an offence legally punishable; but if a libel in a man's handwriting be found, the proof is thrown upon him to show that he did not also publish it. Libellers may be punished by indictment or criminal information, and by action. In a civil action the question whether the publication is or is not a libel is one for the judge or court. Indictment or criminal information is for the public offence—as it is termed—for every libel has a tendency to a breach of the peace by provoking the person libelled; the civil action is to recover damages by the party for the injury caused him by the libel. A fair report of judicial proceedings does not amount to a libel, and by the Libel Law Amendment Act of 1888, "fair and accurate newspaper reports of proceedings of a court or public meeting" are protected. An Act of Parliament of the present reign, the 6 & 7 Vict., c. 96, entitled "An Act to amend the Law respecting Defamatory Words and Libel," has made important alterations in the law of defamation and libel, for it enacts: (Sec. 1), That in any action for defamation it shall be lawful for the defendant, subject to certain notice in writing therein prescribed, to give in evidence, in mitigation of damages, that he made or offered an apology to the plaintiff for such defamation at such time as in the said section is more particularly described. (Sec. 6), That on the trial of any indictment or information for a defamatory libel, the defendant, having pleaded such plea as therein-after mentioned, the truth of the matters charged may be inquired into, but shall not amount to a defence unless it was for the public benefit that the said matters charged should be published. The defendant must in his plea to such indictment or information allege the truth of the matters charged in the manner that is required in pleading a justification to an action for defamation. Sec. 7 enacts that when on the trial of any indictment or information, for the publication of a libel, under the plea of not guilty, evidence shall have been given which shall establish a presumptive case of publication against the defendant by the act of any other person by his authority, it shall be competent to the defendant to prove that such publication

was made without his authority, consent, or knowledge, and that the said publication did not arise from want of due care or caution on his part. This Act does not extend to Scotland, but it was extended to Ireland by a later statute. The printer of a libel is liable to prosecution as well as the author, and so is the person who sells it, even though he be ignorant of its contents. It is a good defence to an action for libel that it was written or printed on a privileged occasion—for instance, the giving a character of a servant or commenting upon a matter of general interest to the public.

Libration. The moon rotates on her axis in the same time as she revolves in her orbit; but, although the former motion is perfectly uniform, the latter is not. Hence, instead of seeing always exactly the same portion of her surface, we have two narrow strips extending between her poles on her eastern and western sides alternately shown to us. This phenomenon is called the moon's *libration in longitude*. Since the moon's axis is not quite perpendicular to the plane of her orbit, at different times we see different bits of the surface round her poles. This is the *libration in latitude*. The fact that we are on the surface, and not at the centre, of the earth causes the *diurnal libration*; for we see a little more of one limb when the moon is on the horizon, and a little more of the other when she is high in the heavens. On account of these librations we are able to get some knowledge of rather more than half the moon's surface.

Libretto (Italian, "little book"), a book containing the words of an opera or oratorio. They very rarely possess any literary value.

Libri-Carucci, GUILLAUME TIMOLEON, CONTI DI (1803–69), an Italian mathematician, born at Florence, became professor of mathematics in Pisa University before he was of age. In 1830 he was compelled by his liberal opinions to take refuge in France, where he was naturalised, and in 1833 was appointed professor at the Sorbonne on Arago's recommendation. He also became Chief Inspector of Public Instruction, and was given the Legion of Honour, and edited for some time the *Journal des Savants*. He collected a fine library, but was not scrupulous in his method of obtaining books, and in 1850 was sentenced to ten years' imprisonment for stealing from public libraries. He died at Fiesole, having spent some time in England. His chief work was a *History of the Mathematical Sciences in Italy* (1834–41).

Libyans. [BERBERS.]

Lice, a family of wingless Rhynchota which live on the skin of mammals. The six legs each end in a strong hooked joint, by means of which they attach themselves to the fur. The proboscis is armed, and by this the insect cuts into its host and sucks its blood. The metamorphosis is incomplete, and the development is generally very rapid, the commonest of the three lice which attack man (*Pediculus capitis*) being mature in about three weeks. The Bird-lice (*Mallophaga*) are often associated with the true lice or *Pediculidæ* as an order, the Anoplura. The Bee-louse

(*Braula ceca*, Nitsch) is quite distinct; it is a small wingless fly belonging to the Homaloptera (q.v.). Woodlice are Crustacea, and Plant-lice are Aphides, both very different.

License (LICENSING LAWS) generally is an authority to do something which would otherwise be inoperative, wrongful, or illegal. In regard to real property a license is an authority to do an act which would otherwise be a trespass. Thus a lease often contains a covenant by the lessee not to assign without license. A marriage license is an authority enabling two persons to be married. [MARRIAGE.] Licenses for the manufacture and sale of intoxicating drinks and refreshments are of three kinds, according to the authorities by whom they are granted. A Magistrate's License is analogous to a certificate that the applicant is a proper person to be intrusted with the sale of intoxicating liquors and that the premises which he occupies are suitable for the purpose. In counties new licenses are granted by the justices present at the meeting for that purpose held by them every year, and called "The General Annual Licensing Meeting," and must be confirmed—except in the case of outdoor licenses—by a standing committee appointed every year from among themselves by the justices at Quarter Sessions and known as the "County Licensing Committee." In boroughs licenses are granted by the "Borough Licensing Committee," appointed every year from among themselves by the borough justices, and confirmed by the whole body of borough justices, or if the borough has not ten justices, licenses are granted by the borough justices and confirmed by a "joint committee" composed of six borough and county justices. The Magistrate's License entitles the holder to take out the corresponding Excise License which is granted by the Commissioners of Inland Revenue, and is a mode of levying a tax on the sale of liquors and refreshments. Both Magistrates' and Excise Licenses require to be renewed every year, and are of various descriptions according to the number and kind of liquors authorised to be sold under them (the public-house license, the beer license, etc.), and as to whether the liquor is to be consumed on or off the premises and to the period of day during which such consumption is authorised. A provisional license may also be granted in respect to premises about to be constructed or in course of construction. An additional license is one granted to the holder of a "strong beer dealer's wholesale license," and authorises him to sell beer by retail for consumption off the premises. There are also excise licenses granted without the necessity of a Magistrate's License—for instance, the "Refreshment House License," which does not authorise the sale of intoxicating liquors, and the licenses to brewers, wholesale beer-dealers, maltsters, distillers, dealers in foreign wines, manufacturers of and dealers in tobacco, etc. Among miscellaneous licenses may be mentioned the Occasional License, in the strict sense of the word, viz. a license granted by the excise authorities on the written consent of a justice to a person already licensed to sell liquors

to be consumed off the premises, authorising the sale of them at some other place between certain hours and on a special occasion, viz. a fair, race, ball, etc., specified in the license. The term "occasional license" is also applied to an exemption granted by the Commissioners of Police or other "local authority" of the district exempting the person to whom it is granted from the rules relating to the closing of premises on a special occasion, e.g. a fête or ball, during certain hours specified in the license. There are also numerous other varieties of license, as for private lunatic asylums, music-halls, race-courses, theatres, game, hackney coaches, etc.

Lichens, a large and varied group of plants, mostly dry, dead-looking, slow-growing, but long-lived, that used formerly to be classed as a separate division of the Thallophyta, co-ordinate with Algae and Fungi. The view originally put forth by Schwendener is, however, now generally accepted, according to which lichens are regarded as Algae living in symbiosis (q.v.) with Fungi. The alga is one of the lower, unicellular forms, such as *Protococcus* or *Nostoc*, forming a layer of green cells, or *gonidia*, enclosed by the hyphae of an ascomycetous fungus, belonging either to the Discomycetes or to the Pyrenomycetes, or very rarely by those of a basidiomycetous one. The spores of the lichen-fungus are generally produced in *apothecia* or in *pyrenocarps* and, on germinating, produce hyphae which enclose gonidial cells or *soredia*, the two growing into a new thallus. The apothecia and pyrenocarps seem to be fructifications resulting from a sexual act. A branch hypha (*procarp*) has its basal portion twisted like a corkscrew (the *archicarp* or *ascogonium*), whilst its upper portion is a row of cells (*trichogyne*) reaching to the surface of the thallus. In special cavities in the thallus (*spermogonia*) numerous male bodies or *spermatia* are produced on hyphal bases known as *sterigmata*. The spermatia are conveyed by water to the trichogyne, with which they conjugate, and, as a result, *asci* grow out from the ascogonium. Lichens grow on exposed situations on rocks, walls, or trees, in all parts of the globe, extending farther up mountains and towards the poles than other plants, and living far longer than most fungi or algae. Some are nutritious, such as Iceland Moss (q.v.), tripe-de-roche (*Umbilicaria*) and Reindeer Moss (*Cladonia rangiferina*); and others afford important dyes, such as orchil and litmus (q.v.), from species of *Rocella*, and cudbear, from *Lecanora tartarea*.

Lichfield, one of the oldest towns in England, is in South Staffordshire, a few miles N.W. of Tamworth, and 17 miles S.E. of the county-town. Its ecclesiastical history dates back to 656, when a Mercian bishopric was founded here. In the last quarter of the 8th century it became an archiepiscopal see, and for a time contested the primacy with Canterbury. In the 11th century the see was transferred to Chester, and then to Coventry, but in 1148 it again became the seat of a bishop. There was a Norman cathedral here, but the present building is in the main Early English, dating from the opening of the 13th century. [GOTHIC

ARCHITECTURE.] It was much injured during the siege in 1643, but was repaired after the Restoration, and was restored during the third quarter of the 19th century. There are no traces of the castle where Richard II. was imprisoned; but there are hospitals, founded in 1495 and 1504, and a King Edward VI. grammar school, among whose pupils were Dr. Johnson, Garrick, and Addison. The former was a native of Lichfield, and in 1838 a statue was erected to him in the market-place. Lichfield was disfranchised by the third Reform Bill. It now gives its name to a county division.

Lichtenberg, GEORG CHRISTOPH (1742-99), a physicist and satirical writer, was born at Darmstadt, and held chairs of Physics at Göttingen from 1770 till his death. He described in two memoirs on electricity what are called the "Lichtenberg figures" (q.v.), and partly edited from 1780 to 1782 the *Göttingen Magazine of Literature and Science*. As a satirist he became known as the ridiculer of Lavater and of Voss's views on Greek pronunciation.

Lichtenberg Figures illustrate the distribution of static charges of electricity on the surfaces of insulators. If a charged body is applied to a sheet of ebonite or other non-conductor, the charge will leak over its surface in an irregular manner, and may be rendered evident by dusting the surface with a fine powder, which adheres to the electrified portions. The shapes of the figures vary according to whether the charge is positive or negative. If different patterns are traced out with two conductors—one positively and the other negatively charged—and if the plate is then dusted over with a mixture of red-lead and sulphur powder by means of a sieve, the two powders will arrange themselves on the two patterns. The red lead becomes positively, and the sulphur negatively, charged by friction with the sieve, and the different powders adhere respectively to the negatively and positively charged parts of the plate.

Lick Observatory, THE, was built at the expense of James Lick, an American millionaire, who died in 1876 and is buried in a vault underneath the pier that supports the great telescope. It is situated on one of the peaks of Mount Hamilton, 26 miles E. of San José, California, and belongs to the university of that state. The telescope has the largest object-glass in the world, and can be used as a camera to photograph the stars.

Lictors, officers who attended the Roman magistrates in ancient times; they bore the fasces, and their duties were to clear the way, to arrest offenders, and sometimes execute judgment on them.

Liddell, HENRY GEORGE (b. 1811), the Greek lexicographer, was educated at Charterhouse and Christ Church, Oxford. In 1833 he took a first class both in classics and mathematics, and in 1845 was made Professor of Moral Philosophy. From 1846 to 1855 he was headmaster of Westminster, and from 1855 to 1892 Dean of Christ Church. The first edition of the Greek lexicon which he compiled with Dr. Scott, afterwards Master of Balliol and Dean of Rochester, came out in 1843, and soon became a standard work. Dr.

Liddell, who was Vice-Chancellor from 1870 to 1874, also wrote a *History of Rome*.

Liddon, HENRY PARRY (1829-90), was born in Hampshire, and educated at King's College school and at Christ Church, Oxford. From 1854 to 1859 he was Vice-Principal of Cuddesdon Theological College, and in the latter year returned to Oxford as Vice-Principal of St. Edmund's Hall. Here his lectures on the New Testament were crowded, and his University Sermons were largely attended. It was in 1866 that he first gained a wide reputation by his Bampton Lectures on the Divinity of Christ. In 1870, when he was created D.C.L., Liddon was appointed Ireland Professor of Exegesis, and also Canon of St. Paul's. His sermons in the great cathedral were for twenty years one of the features of London life. In 1876 he and Canon MacColl played a notable part in the agitation concerning the Bulgarian atrocities, and in 1881 and the following years he defended the position of the Ritualists. In 1886 he was elected Bishop of Edinburgh, but declined to accept the position, as he had previously tentative offers of English sees. He began a *Life of Pusey*, but only three volumes had been completed when he died.

Lie, JONAS (b. 1833), the Norwegian novelist, was born at Eker. He practised as an advocate for some years before adopting literature as his career. His chief novels are *The Man with the Second Sight* (1870), *The Pilot and his Wife* (1874), *The Family at Gilje* (1883), *Married Life* (1887), and *Maisa Jons* (1889). They describe Norwegian domestic life. Lie has also written some poems, short stories, and a comedy, *Grabow's Cat* (1880).

Liebig, JUSTUS, BARON VON (1803-73), the great German chemist, was born at Darmstadt, where his father was a drysalter. He studied chemistry at Bonn and Erlangen, and took the degree of Ph.D. at the latter, after which he was sent to Paris at the expense of the Grand Duke of Hesse. Here he became the pupil of Gay-Lussac and the protégé of A. von Humboldt. The influence of the latter obtained for him in 1824 a professorship of chemistry at Giessen. Liebig made Giessen the first school of chemistry in Europe. In his laboratory, the first of its kind, were trained most of the great chemists of the century. In 1845 he was created Freiherr, or Hereditary Baron, and in 1852 left Giessen for Munich. Here, besides being Professor of Chemistry, he was after 1860 President of the Academy of Sciences. He was the founder of agricultural chemistry, made important contributions to animal physiology, and in pure organic chemistry determined the constituents of acids, elicited for the first time chloral and chloroform, and discovered the compound aldehyde.

Liechtenstein, a small independent principality situated between the Vorarlberg and Switzerland. Its total area is only 61 square miles. It belonged to the German Confederation till its dissolution in 1866. The Liechtenstein Legislative Assembly consists of 15 members, of whom 3 are nominated by the Prince and the rest elected by the people. The principality belongs to the Austrian

Customs' and Postal Union. The inhabitants of the capital (now Liechtenstein, formerly called Vaduz) are exempt from military duty. The present Prince has estates in Austria and Germany, and is an Austrian political leader.

Liège (Flemish, LEICH), one of the chief towns of Belgium, stands at the junction of the Meuse and Ourthe, 16 miles S.S.W. of Maestricht, and 56 miles by road E.S.E. of Brussels. The old town is on the left bank, the new town on the right bank of the Meuse. The feudal rulers of Liège up to the time of the French Revolution were the Prince-Bishops, who in the 14th century became Princes of the Empire. Continual struggles went on between them and the citizens which led to much bloodshed. In 1467 and 1468 Charles the Bold of Burgundy assisted the Prince-Bishop to subdue the citizens, whose attempts at independence were secretly encouraged by his rival Louis XI. of France. In 1650 a strong citadel was built overlooking the left bank of the Meuse, and the town was effectually bridled. It was bombarded for five days by the French in 1691, was taken by Marlborough in 1702, and again by the French in 1792. Although the old cathedral of St. Lambert was destroyed by the revolutionists in 1794, Liège is still rich in churches. St. Paul's, which has a fine pulpit carved by Geefs, has taken the place of St. Lambert. Holy Cross, founded in the 10th century, belongs chiefly to the 12th and 14th. Other churches are St. Jacques, a 10th-century building, with a polygonal choir; St. Martin, an old church, which was rebuilt in the 16th century; and St. Barthélemy. The 16th-century palace of the Prince-Bishops is now used for law courts and university buildings. The university of Liège is a flourishing institution of the early 17th century, having a school of mines and several other educational institutions attached to it. The city is strongly fortified and adorned by numerous handsome bridges. It is the centre of a great mining district, coal being found under the city and the river. More firearms are made here than in any other town in the world, and there are manufactories of wool, leather, machinery, and steel and iron goods. The city and episcopal territories became a part of Belgium in 1831. The province of Liège, having an area of 1,117 square miles, has Limburg on the N., and Luxemburg on the S. Its principal industries are woollen manufacture and mining; carrier pigeons are also reared.

Liegnitz, a town in Silesia, 38 miles W.N.W. of Breslau. In the 12th century it was the residence of the Dukes of Lower Silesia, and was for four centuries afterwards the capital of a small principality. Its vicinity has been the scene of three great battles, that of Wahlstadt, where in 1241 the Mongols defeated the Poles, of a victory over the Austrians by Frederick the Great in 1760, and of Blücher's victory on the Katzbach in 1813 during the War of Liberation. The modern town has iron-foundries and potteries, makes pianos, and manufactures woollens, cloth, hats, etc.

Lien (from the French *lien*, a "tie" or "band"), is a right in one person to retain that in his or her possession belonging to another till certain demands

of the holder or person in possession are satisfied. Liens arise either by express contract, by usage of trade, or where there is some legal relation. (1) Where by *express contract* it is simply pawn, mortgage, or pledge, which are then the most appropriate terms; or it is an agreement (such as that between principal and factor) that goods intrusted by one person to another for the purpose of sale or for some other purpose than pledge, may be retained by the party intrusted with them as a security for any debt or balance due from the other; or it is an agreement that he may retain the proceeds of things intrusted to him to sell for the same purpose. (2) *The lien by usage*. The "usage of trade" is evidence from which contract is to be implied; parties who mutually act in conformity to a custom have in effect, though not in form, made a contract. (3) The term *legal relation* is only another mode of expressing the mutual rights and duties of the same parties, who by their acts have brought themselves within the limits of a custom, and so shown an intention to make a contract. Thus an inn-keeper has a lien upon the horse of his guest which he takes into his stable to feed. Lien, unless by express contract or custom to the contrary, must from its nature be *particular*, that is, must have reference to a particular transaction and to a particular thing. Where it is general, that is, exists with respect to other transactions also, there must be express contract, or the dealings of the parties must be such as to create that implied contract which arises from acts done in conformity to well-known usage. A lien may be lost by voluntarily parting with the thing, or by express agreement, or by agreement to be implied from acts. In general, one who has a lien for a debt waives it by taking security. The doctrine of lien continually gives rise to numerous and intricate legal questions.

Lieutenant, one holding the place of another, an officer holding a secondary position, *e.g.* in the army, a lieutenant-general, or an officer next in rank to a general; in civil life, a lieutenant-governor or an officer next in rank to a governor. The term lieutenant is more specially applied without qualification to certain officers of the army and navy: in the army, to a subaltern officer in rank next below a captain, and equal in rank to a sub-lieutenant in the navy; in the navy, to an officer next in rank below a commander, and equal in rank to a captain, or (if of eight years' seniority) to a major, in the army. In the navy, a lieutenant is third in command of a battleship, second in command of a corvette or sloop, and, as a rule, the commanding officer of any smaller craft. [FLAG LIEUTENANT.] Ships in the navy carry from one to six lieutenants, or even more; and in all large ships are lieutenants specially qualified for gunnery and torpedo work, while, unless there be a commander for navigating duties, there is also a lieutenant specially appointed for navigation.

Life, the subject-matter of biology, has never, perhaps, been satisfactorily defined. One of the earliest, simplest, and best definitions is that of St. Thomas Aquinas, that life is self-movement. Haeffland's "life is the activity of the organic

forces," explains little; Bichat's, "the sum-total of the forces which resist death," is purely negative; Fichte's, "the self-sustentation of the organism," is very narrow and one-sided, applying solely to vegetative growth, and Duges's, "the special activity of organised bodies;" and Beclard's, "organisation in action," seem hardly maintainable in the face of the absence of organisation in the lowest animals, such as amœba. Schelling's, "tendency to individuation," refers rather to structural development than to the vital functions of a mature organism, and might include crystallisation; and Richerand's, "a collection of phenomena which succeed each other during a limited time in an organised body," applies equally to decomposition after death. De Blainville's, "the twofold internal movement of composition and decomposition, at once general and continuous," expresses, as Mr. Herbert Spencer points out, only vegetative life, and is equally applicable to a galvanic battery. Three better and closely-allied definitions are those of Cuvier, Schopenhauer, and Lewes. Cuvier's, "the capacity of the organism for assimilating external elements, and preserving its own identity," refers too exclusively to nutrition. Schopenhauer's, "that condition of a body in which it preserves its essential form, whilst the matter of which it is composed is constantly changing," also too much ignores active life, such as that manifested by muscular and nervous action. G. H. Lewes's, "a series of definite and successive changes, both of structure and composition, which take place within an individual without destroying its identity," seems to deny the obvious fact that many vital processes are not successive but simultaneous. Mr. Spencer first suggests, "the co-ordination of actions," and then, in order to exclude the action of a glacier, for instance, "the definite combination of heterogeneous changes, both simultaneous and successive." He then points out that we commonly recognise the living by its giving a fit response to an external stimulus, the tree budding or the animal shrinking from the touch, and adds the words "in correspondence with external co-existences and sequences" to his first definition, which he then abbreviates into "the continuous adjustment of internal relations to external relations," a formula little more suggestive of any adequate conception of life than that of Schelling. The facts that life is always manifested in the presence of protoplasm (q.v.) which has been termed "the physical basis of life," a spontaneously decomposing complex admixture of compounds of carbon, hydrogen, oxygen, nitrogen, and sulphur, saturated with water; that living bodies possess the two great powers of assimilation and reproduction, and that they have generally curved outlines, if not also a definite form and some organisation or differentiation of parts, have been dealt with further under BIOLOGY (q.v.).

Life-Belt, a small jacket of canvas, partially covered with slabs of cork, and worn close under the arms, its object being to support a man in water. The regulation naval life-belt weighs 5 lbs., and has a buoyancy of 20 lbs.

Life-Boat, any boat made with special and unusual provision for buoyancy and righting power: particularly one intended for the preservation of life from shipwrecked vessels. The construction of such a boat was first suggested by the subscribers to the News Room at the Law House, South Shields, in 1789, after the terrible loss (with all hands) of the *Adventure*: and, many plans having been offered, Mr. Greathead's was unanimously accepted, and a boat on that principle was completed in 1790, and during the following 21 years saved 300 lives off the mouth of the Tyne. Numerous other boats on the same system were soon built, and Mr. Greathead was deservedly rewarded by the British and several foreign Governments. All subsequent life-boats designed to be despatched from the shore may be regarded as improvements upon his. [NATIONAL LIFE-BOAT INSTITUTION.] Ship's life-boats are boats suited for rowing, sailing, or steaming, as the case may be, and fitted with air-chambers to conduce to buoyancy, but not externally differing to any great extent from other ship's boats.

Life-Buoy, any buoyant object intended for the support of a man or men in the water, and capable of being thrown or detached from a ship or pier into the sea. The naval service life-buoy, which is supposed to be capable of keeping four men afloat, is fitted with a portfire, which lights itself automatically and burns for 20 minutes, so as to indicate the position of the buoy in darkness. The ring-shaped cork life-buoy is, however, a commoner and more familiar form. Buoys of similar shape are sometimes made of rushes covered with canvas. There are many other types of life-buoy, some of which contain supplies of food and water sufficient for the maintenance of life for a week.

Life-Saving at Sea. [LIFE-BELT, LIFE-BOAT, LIFE-BUOY, etc.]

Lifts may be worked by steam, gas, manual, or hydraulic power. A cage is arranged to be movable up or down a rectangular shaft, and in the case of non-hydraulic lifts is suspended by manilla or steel ropes or chains, which are passed over a grooved pulley at the top of the shaft, and support a weight which approximately balances the cage. The pulley may be rotated to raise the cage by means of belt or spur gearing from a countershaft driven by an engine, suitable mechanism being provided for reversing the motion for lowering or putting on the brake when the cage is stationary. In manual lifts a second rope, connected to the first by spur gearing, can be rotated by a long rope passed round it, by pulling which the gear can be driven in either direction. In some hydraulic lifts a long rod which supports the cage acts as the plunger of a cylinder sunk in the ground; water under pressure being admitted through a valve, the plunger is forced upwards, while a valve which allows the water to escape provides for the lowering of the cage. Owing to the difficulty of sinking the cylinder in a pit, telescopic cylinders are sometimes used, or a short cylinder acts on a chain supporting the cage through pulleys so arranged that a small motion of

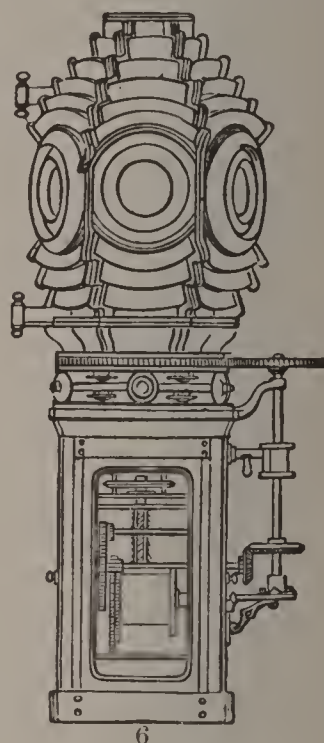
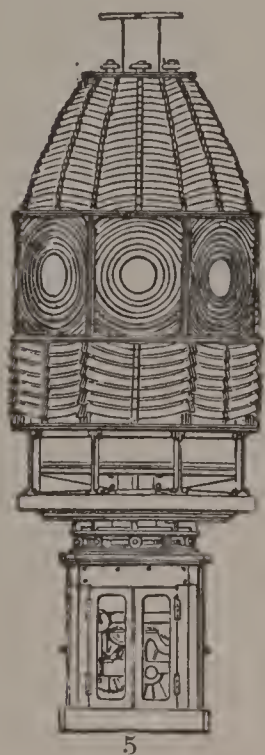
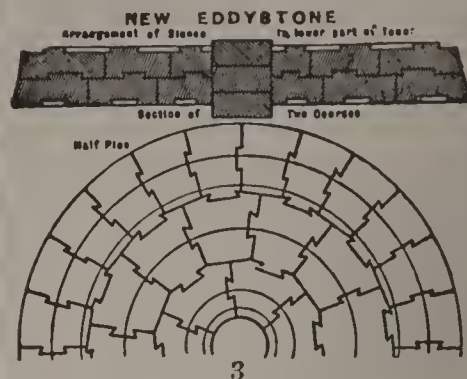
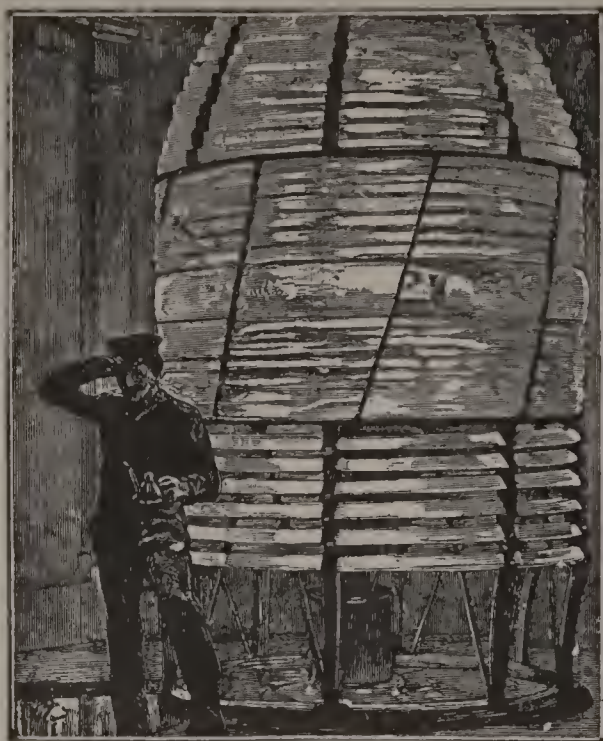
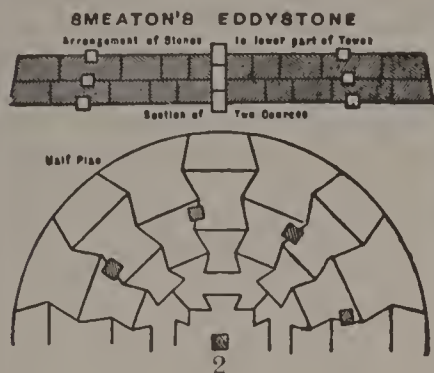
the ram produces a relatively large motion of the cage. In all power lifts a rope which controls the gearing or valves hangs down inside the shaft, and is accessible from the cage.

Ligament, a band of connective tissue which serves to unite and bind together certain animal structures. Ligaments are typically developed in joints, and the tendons which serve to connect muscles with bones are modified ligaments. Ligaments are usually composed of white fibrous connective tissue, but in some cases—as, for example, in the *ligamentum nuchæ*, which attains to huge proportions in the neck of the ox, horse, etc.—yellow elastic tissue forms the basis of the structure.

Ligan, goods which are cast into the sea, but which have been tied to a buoy or cork that they may be found again. [FLOTSAM.]

Light, **LIGHTING**. Light is a special effect on special sense-organs that are possessed by the more highly-developed animal organisms. The nerve matter that most readily appreciates light is concentrated in the eye (q.v.), though other parts of the body may in certain cases be susceptible. It is better to regard light as the effect, rather than the cause, since the same cause may in one case produce the effect of light and in another case, equally normal, no such effect. For this cause is essentially a vibratory motion possessed by the particles of all the matter with which we are acquainted, and by the ether (q.v.) which permeates all space that is not absolutely occupied by these particles. Given such a particle in an isotropic material, its motion would be transmitted to the surrounding particles by spherical waves that would undulate through the substance, in the same sort of way that a particle of water oscillating on the surface of a smooth pond transmits its motion by circular waves. That portion of the human eye (q.v.) known as the *retina* is directly affected by these vibrations, provided that they are sufficiently intense, and that the frequency of the wave lies within certain limits. No effect of light is produced when the intensity is insufficient or when the frequency is outside the given limits. Excessive intensity may permanently damage the retina, as is sometimes the case with lightning flashes. The ordinary limits of frequency are 400 to 750 billions per second. Waves outside these limits may be appreciated by their heating or other effects, but not by the sense of sight. The difference of effect of waves of different frequencies is that of *colour* (q.v.). Waves with a frequency of about 400 billions per second affect the eye as red colour, those of 750 billions as violet colour, and intermediate frequencies give the range from red, through the orange, yellow, green, blue and indigo, to the violet. If a body is emitting waves of all these frequencies in a certain proportion, the effect on the eye is complex and the colour is called white. Such mixed light may often be resolved into its constituent colours, as in spectrum analysis (q.v.), and its complexity demonstrated. Waves of different frequencies appear to travel through the same medium at the same rate, though the rate varies with the medium. The speed in a vacuum is about

186,000 miles per second. Light cannot penetrate wood of any great thickness; such a substance is termed opaque. It can pass through clear glass readily without irregular deformation of the waves; such a substance is called *transparent*. Through opal glass light can certainly pass to some extent, but the passage is irregular and the emerging waves give no notion of the form they possessed before entering the glass; such a substance is *translucent*. When light waves impinge against the surface of an opaque substance there occurs a certain amount of absorption, the particles of the substance taking up the motion, and also a portion is reflected back. Polished silver absorbs extremely little and reflects nearly all the light that strikes on it. Lampblack absorbs practically all, and reflects none. Even transparent substances reflect a small amount of light from their surfaces. The shape of the reflecting surface may be made so as to concentrate the return-wave to a point, or to cause it to diverge more, or to send it back with just the same form as it possessed before striking the reflector. The last case is effected with plane mirrors; the other two with concave or convex mirrors. Similar changes of form of wave-fronts may be effected by the passage of the waves into transparent media, the most usual arrangements to effect such results being lenses (q.v.). The practical question of the supply of light by artificial or natural means is of much importance, but only recently has a clear knowledge of the deficiencies of present systems been obtained. The natural source of light is the sun and, for the most part, it is also indirectly the source of artificial light. The combustion of various materials may give a high intensity of temperature [HEAT], but this in itself is not sufficient. It is necessary that the radiation from the hot substance shall consist in part of waves corresponding to certain frequencies between the limits before mentioned. Even within this range the intensity of illumination varies greatly with the frequency of the waves. When a substance is heated sufficiently, either by its own combustion or by other means, a mixture of waves is emitted, not all of which lie within the desired limits. Those that do not are wasted, so far as illumination is concerned. Perhaps they may supply much heat, or, indeed, they may be so intense as to effect chemical decompositions that ordinary sensible heat cannot perform. But from the present point of view they are waste products, and it becomes necessary either to avoid their production, or else to transform them into light-giving waves. Of all the energy stored up in coal used for gas manufacture, energy represented by the separation of carbon from oxygen by prehistoric action of the sun's radiant energy on living vegetable matter, not one per cent. is converted into light radiation when the ultimate coal-gas is burnt in air. If, instead of being produced by burning of gas, the light is produced by the sufficient heating of a carbon filament or of carbon vapour through the passage of an electric current, the resulting illumination has advantages in quality which render it more desirable. But still it is a mixture of useful and useless radiation, and fully 90 per cent. of the energy of



LIGHTHOUSES.

Interior of the Light Chamber of the Eddystone. 2 Smeaton's Eddystone—showing Half Plan and Arrangement of Stones. 3 New Eddystone—showing Half Plan and Arrangement of Stones. 4 New Eddystone Lighthouse. 5 and 6 Holophotal Revolving Light (First and Fourth Order) from Drawings supplied by Messrs. Wilkins & Co. 7 Destruction of Rudyard's Lighthouse. 8 Winstanley's Lighthouse.

the original coal is lost in the steam-engine and dynamo-electric machinery (q.v.), before being converted into the energy of electric current. The two main points to consider, if we wish to economise the rapidly-diminishing supply of coal in the world, are: (1) how to transform the potential energy in the coal into vibratory energy of one frequency only, and (2) how to alter the one frequency without waste into another that gives light. When any metal, *e.g.* sodium, is burnt, there is certain production of light of definite and constant frequency; to obtain this alone would be a solution of the two problems applied to expensive sodium instead of relatively inexpensive coal. The phenomena of fluorescence (q.v.) and of calorescence (q.v.) offer suggestions for the solution of the second problem, and possibly the invention of a cheap electric battery of coal would be the main step towards that of the first.

Light and Air. [EASEMENTS.]

Lightfoot, JOSEPH BARBER (1828-89), was the son of a Liverpool accountant. He was educated at King Edward's school, Birmingham, and at Trinity College, Cambridge. He was elected a scholar of his college in 1849, a fellow in 1851, and a tutor in 1857. He was senior classic (1851), first Chancellor's medallist, and a wrangler. He was ordained in 1854, and in 1861 was elected Hulsean Professor of Divinity. His lectures on the New Testament were crowded beyond precedent. In 1862 he became chaplain to the Queen and examining chaplain to the Bishop of London, but refused to stand for the Regius Professorship of Divinity at Cambridge in 1870. Five years later, however, he accepted the Lady Margaret professorship. In 1871 he was appointed Canon of St. Paul's, having in 1867 declined the see of Lichfield. In 1879 he accepted that of Durham, and continued to spend the whole of his episcopal income in the diocese till his death.

Lighthouse, a conspicuous building carrying at night a light for the warning or guidance of mariners. Lighthouses were of very early adoption, and were at first merely towers with open fires upon their summits. Candles, and then oil lamps, behind glass were next used. Oil lamps are still retained in many localities, but are supplemented with scientifically-constructed lanterns and powerful reflectors or refractors, and elsewhere gas or electricity supply the illumination. Simple concave mirrors were originally used to direct the light, spherical parabolic mirrors were next employed. All systems by which the light is thus reflected are termed "catoptric." Early in the 19th century Fresnel introduced the "dioptric" or refracting system of lenses, by the use of which the light is much economised. He also introduced the "catadioptric" system, whereby mirrors and lenses are combined. The "holophotal" system of Mr. T. Stevenson causes the rays from the side of the flame opposite to the mirrors or lenses, as the case may be, to fall upon a series of prisms, from the internal surfaces of which they are reflected back through the lenses. The lights of different lighthouses are distinguished by their colour, by their nature or

intensity, or by their periodicity if they be revolving; and they can thus be easily recognised. Those on the coasts of the United Kingdom number about five hundred. English lights are under the Corporation of the Trinity House [TRINITY HOUSE], Scottish ones under the Commissioners of Northern Lights, and Irish ones under the so-called Ballast Board, or Corporation for Preserving and Improving the Port of Dublin; but all are subordinate to the Board of Trade. Among celebrated British lighthouses are the Eddystone (q.v.), and the following: Smalls Rock, built of wood in 1776, and of granite in 1861; Maplin, built on iron screwed piles in 1838; Bishop Rock, completed in 1858, and raised and altered in 1889; St. Catherine's, built in 1780, reduced in 1840, and furnished with electric light in 1888; Inch Cape, or Bell Rock, finished in 1811; Skerryvore, finished in 1844; North Unst, temporarily erected in 1854, and permanently completed in 1858; and Dhu Heartach, finished in 1872.

Lightning is a large electric spark. In 1752 Franklin of Philadelphia discovered that thunderclouds were always electrified. This he did by sending a kite up into the cloud, and conducting the electricity down the string, and from this experiment he conceived the idea of protecting buildings by wire conductors, down which the electricity could be carried safely away. How it is that the clouds get electrified is not thoroughly known, but it is generally supposed that a certain amount of electricity is produced by friction between the lower clouds, or mists, and the rocks against which they are driven. When rain frequently falls, the charge is carried down, but after dry weather the charge accumulates, and lightning results. The flash takes place either between two clouds, or a cloud and the earth, the air really giving way under the electric strain. The break occurs at the weakest spot, and this will be where some high point on the earth is stretching out towards the clouds; forked lightning then occurs. Another flash often immediately follows the first, and this is known as the "back stroke." "Summer lightning" is generally due to a storm a long distance away. "Globe lightning," or "fire-ball," is not quite understood; it generally lasts several seconds, is less brilliant than forked lightning, and often bursts on reaching the ground, discharging flashes of lightning. The brightness of lightning is very great, but so quick is the flash that it is not fully observed; if it could be made to last even one-tenth of a second, it would be found to be 100,000 times as bright as moonlight. The curious odour noticed during a thunderstorm is due to the formation of ozone by the electric discharge.

Light Ship, a stationary vessel bearing a light, and moored for the benefit of mariners on any spot where, owing to the nature of the bottom, or to other causes, a lighthouse cannot be erected.

Lights, SHIPS', the lanterns carried by ships in order to indicate their nature and movements to other ships at night. A starboard light (green) and a port light (red) are ordered to be carried by all ships when under weigh, and to be so screened as

to throw their beams from right ahead to two points abaft the beam. They should be sufficiently powerful to be visible from a distance of two miles. A steamer under weigh carries a masthead light which throws its beams from right ahead to two points abaft the beam on each side, and which should be visible in clear weather from a distance of five miles. A steamship towing another ship carries two bright white masthead lights disposed vertically, in addition to side-lights. A ship being towed carries side-lights only. Sailing pilot vessels carry a white masthead light visible all round, and also exhibit a flare-up light every fifteen minutes. Fishing vessels and boats at anchor exhibit a bright white light. Boats fishing with drift nets carry on one of their masts two lights, one three feet above the other.

Lignine Dynamite, or LIGNOSE, is a generic term for mixtures of nitro-glycerine with sawdust or wood-pulp, whether nitrated or not. In some forms nitrates are also added. Lignine dynamites were the explosives chiefly favoured by the Irish-American dynamiters.

Lignite, or BROWN COAL, a rock of vegetable origin, generally retaining some of its original fibrous structure, yellow or pale brown to dark brown or black, with a specific gravity of 0·5 to 1·5, burning with a sooty flame, and often with a sulphurous smell, and leaving a good deal of ash. It contains from 55 to 75 per cent. of carbon, and is thus in all respects intermediate between peat (q.v.) and true coal. It varies in some characters according to its matrix. In the Lias and Kimeridge clays coniferous plants yield compact *jet* or *Kimeridge coal*, black, lustrous, and not fibrous; whilst in porous Jurassic limestones, rafts of drift wood still retain a brown colour, and much fibrous structure. In the Lower Eocene Laramie beds of the Rocky Mountains, our own Woolwich beds, the Oligocene Brown-coal beds of North Germany and the Lower Rhine, the Swiss Molasse and the Spitzbergen Miocene coal, the lignite, which is often black and lustrous, though largely coniferous, also consists largely of angiospermous plants. In North Germany it forms the chief fuel of the country.

Lignum vitæ. [GUAIACUM.]

Liguori, ALFONSO MARIA DE' (1696–1787), a saint of the Roman Catholic Church, was born near Naples. He took a degree in law when only sixteen, and had a large practice at the bar, but in 1724 took holy orders. In 1732, having in the meantime gained a high reputation as a preacher, he founded "The Congregation of the Most Holy Redeemer," a society whose chief work was to be the education of the poor. Their "rule" was confirmed by Benedict XIV. in 1749. In 1762 Liguori, who had refused the archbishopric of Palermo, became Bishop of Sant' Agata dei Goti, but resigned his office in 1775 and retired to Nocera dei Pagani, the head-quarters of his order. He was canonised in 1839, and declared a Doctor of the Church by Pius IX. His *Moral Theology* is still in use among Romanists, and his casuistical treatises are also highly valued by them. The

Liguorians or Redemptorists have houses in Germany, Switzerland, and Austria.

Lilac (*Syringa vulgaris*), a favourite shrub in our gardens, supposed to be of Persian origin. It belongs to the Olive family, growing from 4 to 15 feet high, with opposite entire acute leaves, and large terminal panicles of pink or white flowers. The calyx is small, four-toothed and persistent; the corolla salver-shaped with a long tube and four limb-segments; the stamens two, sessile in the corolla-tube; the style bifid and included; and the fruit, a two-chambered, four-seeded capsule. There are numerous slight variations in cultivation, and *S. Josikaea* from Transylvania has flowers which, very unlike those of the other forms, are scentless.

Lille, the ancient capital of Flanders, and at present the chief town of the department of the Nord, France, is 155 miles N. of Paris by rail. Its name is a variant of L'Isle, the old castle being surrounded by marshes. It first became important in the 12th century, but was destroyed by Philip Augustus in 1212. A hundred years later it was ceded to France, but at the end of the 14th century it became Burgundian, and was the residence of Philip the Good. It remained in the possession of various branches of the Hapsburg family till taken by Louis XIV. in 1667. In 1708 it was captured by Marlborough, but in 1792 it successfully sustained a bombardment of nine days from the Austrians. Lille is an important manufacturing town, the spinning of flax employing thousands of hands. There are also woollen, cotton, thread, and damask factories, a state tobacco manufactory, and chemical and dye-works. The chief institutions are a Catholic university, an academy of music, a good picture-gallery, and the Wicar Museum containing original designs of Italian masters. The Communal library has valuable manuscripts.

Lillo, GEORGE (1693–1739), an English dramatist, whose father was a Dutch jeweller, was born in London. He followed his father's trade, but in 1730 made his reputation as a dramatist by *The London Merchant; or, the History of George Barnwell*. It became a stock play at Drury Lane, and used, until quite recently, to be performed every Shrove Tuesday at the Theatre Royal, Manchester. In 1796 Mrs. Siddons and Charles Kemble played in it at Covent Garden. Another play by Lillo, *Fatal Curiosity*, brought out by Fielding at the Haymarket in 1736 or 1737, was also highly popular. Mrs. Siddons and the Kembles played in Mackenzie's version, called *The Shipwreck*, in 1797 at Drury Lane. *George Barnwell* was the first English domestic drama of merit.

Lilly, WILLIAM (1602–81), the astrologer, the Sidrophel of *Hudibras*, was the son of a small farmer of Leicestershire. In 1620 he went to London, and seven years later married the widow of Wright, his employer, and inherited his property. He first turned his attention to astrology in 1632, and in 1644 published the first of his 36 annual almanacks containing predictions of the events of the year. He brought out a "nativity"

of Prince Rupert in 1645, of Strafford and Laud in 1646, and of the King of Sweden in 1659. Some of these almanacs were translated into German, Dutch, and Danish. Lilly pretended to be a Parliamentarian, and in 1648 was asked to attend the siege of Colchester in order to encourage the Parliamentary soldiers by his predictions. In 1651 his *Monarchy and no Monarchy* declared that England should no more be governed by a king; but he got into some trouble two years later by predicting that the Commons and soldiers would combine to overthrow Parliament. At the Restoration he was taken into custody and examined by a committee of the Commons as to his knowledge of the particulars of Charles I.'s execution, but was soon set at liberty. From 1670 till his death Lilly practised medicine.

Lily, a popular name applied to a variety of plants, mostly monocotyledons, with fleshy and generally white flowers, but often not otherwise related, including the various species of the genus *Lilium*, which gives its name to the order Liliaceæ. *Lilium* has a scaly bulb; leaves on its erect stem; and a flowered raceme of large flowers, with a perianth of six segments, distinct or nearly so, always somewhat (often strongly) reflexed; six free stamens with versatile anthers, a three-chambered, many-seeded, superior ovary, elongate style, and tri-lobed stigma. This genus includes *L. candidum*, the old-fashioned white or Annunciation Lily of painters; *L. Martagon*, the Turk's-cap Lily; *L. bulbiferum*, the Tiger Lily, with orange flowers; and the magnificent *L. auratum* of Japan, with white perianth segments studded with crimson points, and each having a median band of yellow. The *water-lilies* (q.v.) are very different plants, dicotyledons belonging to the family Nymphæaceæ. The *Lily-of-the-valley*, *Convallaria majalis*, a British species, though belonging to the Liliaceæ, is far removed in affinity from *Lilium*. It has a long slender rhizome, whence rise branches bearing two broadly-lanceolate leaves, and a drooping raceme of a few small white bell-shaped flowers, with coherent perianth-segments. The fruit, moreover, is baccate, and not, as in true lilies, capsular. *St. Bruno's Lily*, *Anthericum Liliastrum*, is also liliaceous, but not bulbous. Its white sweet-scented flowers have a green dot on each perianth-segment. The *Day Lily*, *Heemerocallis*, has a trumpet-shaped orange perianth with united segments, and is also liliaceous. The *Guernsey Lily*, *Nerine sarniensis*, the pure white *Amazon Lily*, *Eucharis amazonica*, the *Searborough Lily*, *Vallota purpurea*, and the lovely *Belladonna Lily* (so called from its resembling the complexion of a beautiful woman), *Amaryllis Belladonna*, are all members of the order Amaryllidaceæ, differing from the Liliaceæ in having an inferior ovary. So also are our own *Lent Lily*, *Narcissus Pseudo-narcissus*, and the *Whitsun Lily*, *N. poeticus*. The *Trumpet Lily* (known, from pigs eating its corms, as *Pig Lily*, in South Africa), *Richardia æthiopica*, so far from being a true lily, is an aroid, with no perianth, but with a white trumpet-like spathe (q.v.) sheathing round the fleshy spadix (q.v.) of minute flowers.

Lilye, or LILY, WILLIAM, classical grammarian, born at Odiham in Hampshire, 1466, graduated at Oxford, and was elected demy of Magdalen 1486. Having taken his degree he went to the East, and at Rhodes learnt Greek from refugees from Constantinople. He then studied Greek and Latin in Rome and Venice. He returned in 1509 and taught privately in London, but was made headmaster of New St. Paul's school by Dean Colet, in whose *Brerissima Institutio* he had a hand. He wrote some Latin poems, and a volume of Latin verse against a rival schoolmaster called *Antibossicon ad Gulielmum Hormannum*.

Lima, the capital of the Peruvian Republic, is situated on the river Rimac about ten miles from the Pacific Ocean. It is 700 feet above sea-level, and has a very picturesque appearance. Earthquakes have laid it in ruins frequently—notably in 1687, 1746 (when 2,980 houses were destroyed, and 19 ships sunk in its port, Callao), 1764, 1822, 1828. Its principal buildings are the cathedral and the Government house, once the palace, where Pizarro was assassinated. Slavery was abolished in 1828.

Limburg, the name of several provinces and places, the most important of which are the province of Limburg in Holland, and the province of Limburg in Belgium, and the town of Limburg in the province of Liège, where the celebrated cheese is made.

Lime (*Citrus acida*), or the variety *acida* of *C. medica*, is an orange with small flowers, and small, very acid, fruit, varying in form but ending, like the lemon, in a nipple-like boss. It is said to have borne the Sanskrit name *jambira*. The *Sweet Lime* of India is *C. Limetta*, or *C. medica* (var. *Limetta*), differing in its spherical fruit, with sweet, non-aromatic juice. It is said to be wild in the Nilgherry Hills, and is now largely cultivated in Montserrat and other West Indian islands. Jamaica exports some 80,000 gallons of lime-juice annually. It is the most valuable of antiscorbutics for long sea-voyages.

Limelight. An oxyhydrogen jet is directed upon a cylinder of quicklime, a portion of which is thus raised to an exceedingly high temperature, and emits a brilliant white light. The flame may be produced by burning a mixture of oxygen and hydrogen supplied under pressure to a suitable jet, or by blowing a jet of oxygen through a flame of burning hydrogen, coal-gas, or alcohol; or by saturating oxygen with vapour of ether or a volatile hydrocarbon, and burning the mixture. The first method is most effective, but both it and the last mentioned are dangerous if proper precautions are not taken. Coal gas and oxygen, with a "blow-through" jet, are most commonly used.

Limerick, one of the six counties of Munster, Ireland, is bounded on the north by the Shannon, on the east by Tipperary, on the south by Cork, on the west by Kerry. Its chief productions are wheat, barley, and various grains. LIMERICK, the capital of the same county, stands on the Shannon and has a very ancient cathedral and manufactures of linen, woollen, and paper. In 1651 it was taken by General Ireton (q.v.), who died there.

Limestone, a rock mainly composed of calcium carbonate (CaCO_3), sometimes nearly pure and entirely soluble, with effervescence, in hydrochloric acid, sometimes mixed with sand, clay, or other impurities, which may form a residual soil after the removal of the carbonate of lime, as in the case of the red clay over Chalk and Oolite districts. Most limestones are of organic origin, and they vary in texture from the *ooze* of Foraminifera now forming in the deep ocean, the soft earthy *shell-marl* formed in fresh-water lakes, the *shell-sand* of coral and nullipores comminuted by shore winds, and the compact but fine-grained marine *chalk* (q.v.), to the concretionary *travertine* of calcareous springs, the *oolite* (q.v.) of still lagoons, *coral-rock*, or *enerinital marble*, which are partly crystalline; and to more compact but granular limestones, others metamorphosed into a completely crystalline or *saccharoid marble*, and the crystalline *stalaetite* and *stalagmite* of caverns. Thus in many cases all traces of organic or even plastic origin are obliterated. Marmorisation, or conversion into marble, is often the result of heat, as in the chalk through which basaltic dykes are intruded in Rathlin Island. Dolomite (q.v.) when cavernous is also probably due to the alteration of limestone. Some limestones, such as some of the Carboniferous Limestone in Ireland, are so impregnated with sulphuretted hydrogen, probably from animal matter, as to have acquired the name of *stinkstone*. Limestones which contain a considerable admixture of earthy matter, especially those occurring in nodules in clay, are known from their use as *cement-stone* (q.v.). In colour limestones range from white chalk and marble to cream-colour, as in Bath-stone, yellow, brown and red in more or less ferruginous rocks, to blue-grey, as in most Carboniferous Limestone, and to black. Limestones are acted upon by rain water both mechanically and, owing to the presence of carbon-dioxide, chemically. This decomposition, taking place along joints (q.v.), gives rise to caves (q.v.) underground and to the picturesque ravines, buttresses, and pinnacles above ground to which the Carboniferous Limestone owes its name of Mountain Limestone. Besides their employment in building, for roofing or for road-metal, immense quantities of limestone are burnt into quicklime for use in mortar or as a manure.

Lime-tree. [LINDEN.]

Limited Liability Acts, acts which provide that partners in joint-stock companies shall be liable only to the extent of their shares, or some further specified extent, and not to the full extent of their individual means.

Limnocodium, a small freshwater jellyfish which was discovered in the warm tank of the *Victoria regia* at the Botanic Gardens, Regent's Park, where it is sometimes very numerous. It measures less than half an inch across the disk. Habitat unknown. Only one other fresh-water jellyfish, from Lake Tanganyika, is known.

Limoges, a French city, capital of the department of Haute-Vienne, and formerly of Limousin. It is an episcopal see, and has a fine cathedral, a

palace, and hôtel de ville. Its manufactures are woollen, linen, and cotton goods, and paper, and there are tanneries and iron forges.

Limonite, a name applied generally to the hydrous sesqui-oxides of iron which generally occur in an earthy or other massive non-crystalline form, or diffused as colouring matters through rocks of other composition, varying from *yellow ochre* to brown or even black. It is thrown down from water in marsh-lands where iron sulphide becomes sulphate and happens to co-exist with carbonate of lime in the water (*bog iron-ore*); and it is a common decomposition product of other minerals.

Limulus. [KING-CRAB.]

Linacre, or LYNACER, THOMAS (1460–1524), an eminent physician and priest. was born and received his early education in Canterbury. In 1484 he went to Oxford and, having obtained a fellowship, went to Italy and studied at Bologna, Florence, Padua, Rome. On his return he educated Prince Arthur, Henry VII.'s eldest son. He was first president of the College of Physicians, which he helped to found; nevertheless, he gave up practising, and held several important positions in the Church.

Lincoln. 1. An English city, the capital of Lincolnshire (q.v.), is situated on the river Witham 42 miles S. of Hull. It contains one of the finest cathedrals in England and other interesting buildings, notably the ruins of the castle, the guildhall, and several gateways, one Roman. Its manufactures include agricultural machinery and iron foundries; there is a considerable trade in flour, corn, and wool. It has a large annual horse-fair and race meetings.

2. The capital of Nebraska, stands on Salt Creek. It was laid out in 1867, and is now a handsome and thriving city, with fine public buildings including the state Capitol, the university, the prison, an asylum for the insane, and the United States court-house.

Lincoln, ABRAHAM (1809–65), the sixteenth President of the United States, was born in Kentucky in 1809. In 1816 he moved with his father to Spencer county, Indiana. In 1832, on the rebellion of Black Hawk, he joined a volunteer company and served three months as captain. He next opened a country store which failed, but was appointed postmaster of New Salem. From 1834–40 he was a member of the Illinois Legislature, and in 1836 was licensed to practise law. In 1846 he was elected to Congress. In 1849 and 1858 he was unsuccessful in getting a seat in the Senate. In the Republican National Council (1860) he was nominated candidate for the Presidency, and his election next year, being a triumph for the Abolitionists, brought about the Civil War, in which the success of the North was largely due to the high qualities he displayed as an administrator. He was re-elected President in 1864. On the 14th April, 1865, he was shot at Ford's theatre, Washington, by John Wilkes Booth, and died on the following day.

Lincolnshire, a large county on the east coast of England bounded by the Humber, the German Ocean, and the Wash, and by the counties

of York, Nottingham, Leicester, Rutland, Northampton, and Cambridge. A very large portion of the county is below high-water level, being protected by embankments. The principal rivers are the Trent, Witham, Welland, and Ancholme, and the towns Lincoln (q.v.), Grimsby, Bolton, and Grantham.

Lind, JENNY (MADAME OTTO GOLDSCHMIDT) (1820–87), a celebrated public singer, “the Swedish nightingale,” was trained under Garcia at Paris, and was first successful in Berlin (1845), and subsequently in her native city, Stockholm. She appeared at Covent Garden first in 1847. In 1852 she went to the United States, and there married. After an extensive tour she returned to England and settled. In her later years she seldom sang in public, but trained the female voices in her husband’s Bach choir.

Linden, LINE, or in modern times LIME, the English name of a beautiful group of trees, the genus *Tilia*, which gives its name to the order Tiliaceæ. They are large trees with scattered, obliquely-cordate, serrate leaves and clusters of small yellowish flowers, very fragrant and full of honey, with the peduncle adherent to a leaf-like bract. The flowers have 5 inferior sepals, 5 petals, indefinite stamens and a globular 5-chambered, 10-ovuled ovary, which by abortion gives rise to a one-chambered and often only one-seeded fruit. The common linden (*Tilia europæa*) is a native of Europe, the variety *parvifolia* being perhaps indigenous in England; but the commonly-planted *grandifolia* belonging to the south of Europe. Its name occurs in early English place-names, such as Lyndhurst; it is mentioned as a material for shields in the song of Brunanburh; Chaucer writes: “Be ay of chere as light as lefe on linde;” and Shakespeare mentions the tree in the *Tempest*. It was a favourite tree with William III., and many avenues of it were planted by his Whig admirers in England. Its wood is soft but close-grained, and is valued by carvers, turners, and musical-instrument makers. Most of Grinling Gibbons’s delicate carving is in linden wood. The bast (q.v.) or inner bark is tough, and considerable quantities of it are imported as Russia matting, chiefly for gardeners’ use in tying up plants. The tree is also interesting to botanists as the origin of the name of Linnæus and probably also of Lindley. There is a handsome American species (*T. americana*), with larger flowers and larger leaves, darker above and silvery on their under surfaces.

Line, in *geometry*, is the path traced out by a moving point; if the point always travels in the same direction a *straight line* is produced. A line has only one dimension—it has length, but neither breadth nor thickness.

Linen, a fabric manufactured from the fibres of flax (q.v.). The use of linen cloth dates back to the earliest period of which there is any historical record. Flax and linen are mentioned in Genesis and other books of the Old Testament, and there yet remain linen cloths, often extremely fine in texture, which were used as winding-sheets for the embalmed Egyptian mummies. Spinning and

weaving were known to the Greeks and Romans at a very early date, and were probably introduced by the latter people into all the European countries which formed part of their empire. From the beginning of the Middle Ages to the latter part of the 18th century the manufacture of linen continued to occupy an important position amongst the domestic industries of Europe. It appears to have taken root in Flanders about the 11th century. It also flourished vigorously during the Middle Ages in the north of France, where it still holds its ground. Its progress in the United Kingdom was much furthered in the 17th century by the immigration of Huguenot refugees. The decline of the industry began in the last quarter of the 18th century, chiefly through the success of the machinery adopted in the manufacture of cotton. The cotton trade thus gained an ascendancy which it has ever since retained, mainly owing to the greater cheapness of cotton and to the extreme adhesiveness of the gum in flax-fibres, which makes spinning difficult. Like other industries which were pretty generally diffused before the introduction of the factory system, the linen manufacture is now confined to certain well-defined areas. In the United Kingdom the finest linens are produced in the north of Ireland, especially at Belfast and other places in the neighbourhood, which are noted for linen and cambric handkerchiefs, damask table-linen, and similar fabrics. Linen damasks, diaper towelling, and other goods of the same kind are woven in Fife and in Yorkshire. Sailcloth and other heavy linen goods are produced extensively at Dundee, Arbroath, and elsewhere in the county of Forfar. Abroad the industry is almost wholly confined to France, Belgium, and Germany. The French damasks and cambrics have acquired the greatest renown.

Line of Battle. 1. The formation of a fleet of battleships when ready to engage an enemy. 2. The class of vessels designed to participate in a general engagement. This class anciently included vessels of 64 guns and upwards—*i.e.* those of the first, second, and third rates—and it now includes all armoured sea-going ships that are not classed as “cruisers.”

Lines of Force, in magnetism, are imaginary lines representing the direction and magnitude of the resultant force at any point in a magnetic field. If fine iron filings are sifted on a card held over a magnet they arrange themselves along these lines, which invariably form closed figures. The action of one magnet upon another is such that they appear to have a tension in the direction of their length and a pressure at right angles to it; hence they tend to shorten themselves, which occurs when two unlike poles are attracted and approach each other. Any combination of magnets and currents tends to arrange itself so that the lines of force due to all are in the same direction and as short as possible. In the C.G.S. units 411 lines of force proceed from unit magnetic pole.

Ling (*Molva vulgaris*), an important food-fish of the Cod family, common on the northern coasts

of Europe, Iceland, and Greenland, and taken in great numbers with trawls and lines round our shores. It differs from the Hake (q.v.) in having a barbule beneath the chin, and there are several large teeth on the lower jaw and on the vomer. There are two dorsal fins and one anal; the body is greatly elongated, greyish-olive above, silvery-white below, and the fins are edged with white. The general size is from three feet to four feet, but much larger specimens have been taken. Most of the fish caught are dried as stock-fish; and large quantities, in this state, are exported to Spain. The swim-bladders are dressed as sounds, the roes are dried, and from the liver is prepared an oil used for illuminating purposes and sometimes in medicines.

Linga, LINGAM, the symbolic pillar by which the Sivaites represent the Phallus (q.v.). The term *yonî* denotes the mystic oval symbolising the female, or productive power in nature.

Lingard, JOHN (1771-1851), a Roman Catholic writer of great distinction, was born at Winchester. He was educated at Douay, and, after being ordained priest, undertook clerical duties at Newcastle, where he republished (1805) a series of letters contributed to a periodical under the name of *Catholic Loyalty Vindicated*. His other works were *Antiquities of the Anglo-Saxon Church* and *The History of England from the Invasion of the Romans to the Year 1688*, in six vols. 4to (1817-25). Dr. Lingard refused a cardinal's hat. In 1811 he went as mission priest to Hornby, where he died.

Linguatulida, an aberrant order of the Arachnida (Spiders), much degenerated through their parasitic mode of life. The body is wormlike, there are no jaws, and the limbs are only represented by two pairs of hooks near the anterior end. They occur in the bodies of various warm-blooded animals.

Liniments are preparations designed for outward application by rubbing into or smearing over an affected part. Soap liniment, compound camphor liniment, and the liniments of aconite, belladonna, and opium are examples of this form of application. Most of the liniments contain camphor, partly to indicate that they are not intended for internal use.

Link Motion in the steam-engine (q.v.) is an arrangement for varying the amount of motion of the slide-valve that opens and closes the steam-ports leading to the cylinder. The two extremities of the link are made to oscillate backwards and forwards in opposite directions, and a block capable of sliding along the link will take up a motion compounded of these two and depending upon the position of the block. This actuates the slide-valve by means of the valve-rod; and the valve, by shifting the block along the link, may have its motion increased or diminished or entirely reversed. [STEAM-ENGINE.]

Links, a stretch of level or undulating ground on which a golf course is played.

Link-work. [PEAUCELLIER CELL.]

Linley, THOMAS (1725-95), a celebrated English composer, was born at Wells, and studied under Paradies, a famous foreign baritone. He began his musical career by conducting oratorios at Bath, until, by the advice of his son-in-law Sheridan, he came to London, where he gave performances of Handel with Dr. Arnold for some time, and then became one of the proprietors and managers of Drury Lane theatre. His compositions include the music of Sheridan's *Duenna* and of the *Beggar's Opera*, *Gentle Shepherd*, *Carnival of Venice*, etc., besides various vocal pieces.

Linlithgow, or WEST LOTHIAN, a county in Scotland, lies between lat. 55° 49' and 56° 1' N., and long. 3° 18' and 3° 51' W., and contains about 81,100 acres. It is very rich in minerals, including coal, shales, freestone, ironstone, limestone, and its principal manufacture is paraffin oil. Linlithgow Lake, 102 acres in area, is famous for its curling and skating. The towns are Linlithgow (the capital), Bathgate, Queensferry, Borrowstowness.

Linnaeus, CAROLUS, or KARL VON LINNÉ (1707-1778), the great Swedish botanist, who founded the *artificial* system of classifying plants, which has been superseded by the *natural* system of Jussieu (q.v.), was born at Røshult and educated at the grammar school and gymnasium of Wexiö. His taste for botany speedily showed itself, and was encouraged at the university of Lund. He moved to Upsala (1758), and undertook the management of the botanic garden and became the assistant of Rudbeck. He next went to and studied in Lapland, the result being his *Flora Lapponica*, (1735). He took his M.D. degree at the university of Harderwyk, in Holland, in 1735, and then proceeded to Leyden. After visiting England (1736) and Paris (1738), he settled at Stockholm as a physician. In 1741 he became Professor of Medicine, and then of Botany and Natural History. He was made Knight of the Polar Star, with the rank of nobility. His principal works were *Systema Naturæ* and *Fundamenta Botanica* (1735), *Genera Plantarum* (1737), *Classes Plantarum* (1738), *Flora Succica* (1745), *Fauna Succica* (1746), *Philosophia Botanica* (1751), *Species Plantarum* (1753).

Linnet, the finch genus *Linotæ*, especially *L. cannatina*, a common British bird, which, as a species, is resident, though large flocks arrive in spring and leave in autumn. The length is about six inches, and the plumage brown. Red, grey, and brown linnets are names for the same bird in different dress. They prefer uncultivated lands, and feed chiefly on the seeds of flax and hemp, whence their name in many European languages. *L. flavirostris* is the Mountain Linnet, *L. linaria* the Mealy, and *L. canescens* the Mealy Redpoll. [GREENFINCH.]

Linseed, the seed of the flax (q.v.), one of the most valuable of oil seeds. About 16,000,000 bushels are imported annually, chiefly from the East Indies, the Russian seed being smaller. The seed is either brown, white, or red. When crushed the seeds yield about 38 per cent. of *linseed oil*, a valuable drying oil, much used in paints and varnishes and in

making oil-cloth and printing-ink. When cold-drawn it is more viscid than when hot drawn. The four chief commercial varieties are *raw*, *refined*, *artists'*, and *boiled*. The refuse *oil-cake* after the oil is expressed is a most valuable and fattening food for cattle. The mucilaginous testa of the seeds makes them useful for poultices, and as an emollient tea.

Lint, a term applied to a soft material made by scraping linen, designed for application to wounds.

Linton, SIR JAMES DRUMGOLE (b. 1840), President of the Royal Institute of Painters in Water-Colours, born in London, soon showed talent for drawing, and studied at the Newnham Street School of Art, conducted by Leigh. At the age of 21 he exhibited water-colours at the Dudley Gallery and the Institute of Water-Colour Painters. In 1863 he, with others, opened the Institute of Painters in Water-Colours, to which the Queen gave the title of Royal, and conferred the honour of knighthood on its president (1885). In this year also he painted *The Marriage of H.R.H. The Duke of Albany* by the Queen's command. Sir J. Linton is President of the Institute of Painters in Oil-Colours. Among his best pictures are the following: *Maundy Thursday, 1793*, *Love the Conqueror*, and *The Cardinal Minister*.

Linz, a well-built town, the capital of Upper Austria, stands on the Danube at the influx of the Traun. Its principal manufactures are woollen cloth, tobacco, linen, leather, and machinery. Its public buildings include a national museum, a library of 33,000 books, a bishop's seminary, and a commercial school. A fine bridge crosses the Danube, and there are extensive ship-building yards.

Lion (*Felis leo*), the king of beasts, probably the largest of the Cat family, though some authorities maintain that in size it is equalled, if not surpassed, by the tiger. According to Flower and Lydekker (*Mammals Living and Extinct*) the largest tigers appear to exceed the largest lions. Selous gives 10 feet as the extreme measurement of a full-sized South African lion (the tail counting for nearly a third), and his mate may be put at a foot less. Lions constitute a single species, but they are subject to great variation in size and colour, the latter ranging from a deep chestnut-brown to light silvery-grey, and from these arose the stories of a white race of African lions. The male carries a large mane, of darker hue than the body fur, and ranging from pale fulvous to black, has tufts of hair on the elbows, and generally a fringe of hair along the middle line of the belly. It was formerly said that the Asiatic lions had no mane; but some which have lived in confinement have been as fully maned as specimens from Africa. Lions have been known to man since the earliest historic times. They are often mentioned in the Bible and by classic writers. Herodotus records their presence, in his day, in south-eastern Europe, and they were probably not exterminated on the Continent till about 2,000 years ago. Now they range through Africa from north to south, and are found in decreasing numbers in

Mesopotamia, Persia, and in the north-west of India. Lions generally frequent sandy plains and broken ground, where there is shelter of bush and thickets—and are rarely found in forests. They are mostly nocturnal in habit, and lie in ambush for their prey—chiefly antelopes, buffaloes, zebras, giraffes, sometimes young elephants and rhinoceroses, and, near civilised districts, horses, cattle, and sheep. They rarely attack man, except when surprised or wounded, but then they are formidable enemies, and old lions, when too feeble to overcome their accustomed prey, become “man-eaters.” The lion has a single mate, who brings forth from two to four at a birth, and the male assists in providing the young with food and in teaching them to kill. Lions breed pretty freely in captivity—the authorities at the Zoological Gardens, Dublin, being very successful in raising cubs which are marked with spots and stripes, which gradually fade as they reach maturity, and hybrids with the tiger, called lion-tigers, have been obtained. [CAVE-LION.]

Lipari Islands, the name of a group of volcanic islands situated about 24 miles N. of Sicily. They are named after Lipari, the largest, and include also Stromboli, Vulcano, and others. They produce corn and fruit, as well as alum, sulphur, and nitre. The celebrated crater of Vulcano was visited by General Cockburn (1812).

Liparite, RHYOLITE, or QUARTZ-TRACHYTE, a comparatively modern acidic lava, varying considerably in texture, colour, and composition, but having a generally glassy ground-mass containing crystals of sanidine and quartz with various accessory minerals, and named from its extensive occurrence in the Lipari Islands. It contains about 76 per cent. of silica, 13 of alumina, 5 of soda, 4 of potash, and more than $1\frac{1}{2}$ of iron-oxide; and its specific gravity is 2.5 to 2.6. It occurs extensively in Hungary, Iceland, and the western United States. Its glassy condition is obsidian (q.v.).

Lippe, an old North-German principality, bounded by Hanover, Hesse Cassel and Rhenish Prussia, is noted for its saline springs. The principal towns are Detmold, Lemgo, and Bückeburg. It has one vote in the German Reichstag, and one vote in the Federal Council.

Lippi, the name of a family of Florentine artists. The eldest, FRANCESCO FILIPPO (1421–88), took the vows of a Carmelite monk, but abandoned the Church. After many adventures he settled in Italy, and took service under the Grand Duke of Florence. FILIPPO (1460–1505), son of Francesco, enjoyed considerable reputation. LORENZO (1606–64), besides inheriting his ancestors' skill in painting, was a distinguished poet and musician, and wrote a burlesque poem, entitled *Malmantile Racquistato*.

Liquation, a metallurgical process in which a metal is separated from a mixture by so regulating the heat in a *liquation furnace* that one of the metals, if necessary alloyed with another metal added for the purpose, melts and is drawn off from the furnace, leaving the other still solid. Thus from an impure form of copper, obtained in the smelting

of the metal, and known as *black-copper*, the silver present is extracted by first adding a quantity of lead, and then subjecting to moderate heat, whereby the lead and silver form an alloy which melts, and is run off from the copper. The silver is afterwards separated by one of the numerous processes available, *e.g.* Pattinson's or Parke's.

Liquefaction is the process of change from the solid or gaseous into a liquid state. Heat has to be given to a solid to cause it to melt, but when a gas is liquefied heat is taken away from it. [LATENT HEAT.] Until comparatively few years ago it was supposed to be impossible to liquefy many gases, but the recent experiments with liquid oxygen show how much can be done under favourable conditions. It is not sufficient to have a low temperature in order to liquefy a gas; the change of state will not occur unless the pressure be sufficiently high. The effect of pressure on the liquefactions of a solid is not so marked, although it has some slight result.

Liqueurs are sweetened alcoholic liquors which have peculiar and characteristic flavours, owing to the presence of different aromatic compounds. Though giving the liqueur a decidedly pleasant taste, these compounds are, however, frequently of a deleterious nature. The liqueurs may be divided into three classes, *viz.* the *crèmes*, the richest and finest varieties, as *e.g.* *Maraschino*, obtained from cherries. *Chartreuse*, etc.; the *oils*, as *Curaçoa*, obtained from the rinds of oranges, and the *ratafiás* in which the alcohol and flavouring are in the smallest proportions, as in *cau de Noyau*, the flavour of which is due to the hydrocyanic or prussic acid present in the bitter almonds from which it is prepared.

Liquid is a substance that possesses no rigidity, and that offers great resistance to compression—*i.e.* it changes its shape under the action of very small forces, but not its bulk. The rapidity with which a small force can distort a liquid depends upon its *viscosity* (*q.v.*), there being much difference in this respect between a mobile liquid like water and a viscous liquid like glycerine. Many solid substances assume the liquid form under the application of sufficient heat, the actual transition being more or less abrupt and being accompanied with the apparent disappearance of heat. This is lost as heat, but appears as an increased kinetic energy of the particles of the substance as a liquid, which enables them to move past each other with a freedom impossible when the substance was solid.

Liquidambar, a genus of handsome trees forming the order *Altingiaceæ*, related to the planes and willows. They have scattered, petiolate, stipulate, deeply-lobed leaves; monœcious flowers in separate catkins; a two-chambered ovary with many ovules; and broadly-winged seeds. There are three species: *L. styraciflua*, yielding liquidambar copal, a medicinal balsam, native to the Southern United States; *L. orientale*, native to Syria; and *L. Altingia*, native to Java, both sources of the viscid liquid storax now chiefly used in perfumery. It is opaque, greyish-brown,

and of the consistence of honey. Several species have been described as fossils from Tertiary rocks.

Liquidation. [BANKRUPTCY, COMPOSITION.]

Liquorice, an extract from the roots of the leguminous *Glycyrrhiza glabra*, *G. echinata*, and possibly other species. The first-named is an herbaceous perennial, 2 or 3 feet high, native of southern Europe, with pinnate leaves, bluish flowers, a tubular bi-labiate calyx, ovate straight standard-petal, straight pointed keel-petals, diadelphous stamens and an ovate, compressed 1 to 4-seeded pod. It has a tap-root sometimes 5 or 6 feet long. Turkey exports about 5,000 cases of 2½ cwt. each annually, and Spain produces about 3,000 tons. We also obtain large supplies from Italy and Russia, the produce of *G. echinata*, our total imports being from 1,500 to 1,700 tons a year. Liquorice is also cultivated in Surrey and Yorkshire, where it is used for making Pomfret cakes. The roots, which reach an inch in diameter, are sliced and boiled, the extract evaporated to dryness being known as *Spanish juice*. It is rolled into sticks which are black and glassy, 6 to 8 inches long, and wrapped in bay leaves. It owes its sweetness to 6 per cent. of *glycyrrhizin*, a sugar-like substance ($C_{16}H_{24}O_6$), in combination with ammonia. The favourite brands are those of Solazzi and Corigliano in Italy. It is much used as a demulcent for cough-lozenges, and is said to be also employed as an adulterant of porter.

Liquor Laws. [LICENSE, LICENSING LAWS.]

Lisbon, the capital and principal seaport of Portugal, is situated on the right bank of the Tagus, 9 miles from its mouth. The town boasts of fine buildings—including the palace of Ajuda, the castle of St. George, the cathedral, custom-house, church of St. Coração de Jesus—several of which are near the principal square, the Praça de Commercio. It also has scientific and literary institutions and a fine harbour, but the marvel of Lisbon is the marble aqueduct which brings the water more than ten miles across the valley of Alcantara. The exports are wine, oil, and fruit; the imports cotton, sugar, grain, coal, etc. The manufactures include tobacco, soap, wool, and chemicals. On November 1st, 1755, 30,000 inhabitants were destroyed by an earthquake, which wrecked the western half of the city and caused the fall of almost all the large public buildings and churches and convents.

Lissajou's Figures. If rays of light are allowed to fall on a mirror fixed to one branch of a tuning fork they will be reflected, and we can place a second mirror (similarly attached to another tuning fork) so that the rays reflected from the first fall upon the second, and are again reflected on to a screen. We can thus obtain a spot of light on the screen, and by letting either fork vibrate alone, the motion of its attached mirror will cause the spot to travel to and fro in a straight line on the screen. On account of the persistence of vision we then see a line of light. If the first fork can vibrate in a vertical plane and the second in a horizontal one, both being at right angles to the

screen, then the line of light will be either vertical or horizontal according as the first or second fork vibrates alone. If the forks vibrate together the spot of light describes a curve, and the curves so obtained are known as Lissajou's figures. They are of countless different shapes, being determined by the rates at which the forks vibrate. The experiment is an extremely beautiful one, and is also of practical importance, since it gives a means for comparing different tuning forks.

Lissu (LI-TZU), a large nation of the province of Yunnan, south-west China, chiefly in the upper valleys of the Salwen and Mekhong rivers within the Chinese frontier. Those in the vicinity of the large towns recognise the authorities and pay regular tribute; but those of the remote hilly districts are still independent, making periodical raids on the settled populations of the plains. Fair notice, however, is given of these expeditions by an envoy, bearer of a symbolic rod, the strange devices on which are by him interpreted to the Chinese officials. Although possessing no firearms, they generally get the better of the timid peasantry, whose women and children they carry into slavery, plundering and destroying their villages. These relations have been continued for many generations, because the local mandarins, having formerly reported the utter extermination of the Lissu wild tribes, their successors are obliged to keep up the fiction for fear of incurring the wrath of the Imperial Government. Hence the Lissu are officially extinct, but in reality one of the most active and energetic peoples in China. Their weapons are a sabre six feet long, a huge round shield, and an arbalest which sends poisoned arrows farther than the bullets of any Chinese musket. Besides the paramount chief, usually a member of the kindred Mossu nation, there are numerous petty chiefs who regulate all communal affairs. All are still pagans (Shamanists) and polygamists, and much addicted to drink. They depend partly on hunting, partly on agriculture, and trade with the surrounding tribes, using a gold currency obtained from the auriferous sands of the Upper Salwen. (Desgodins, *Les Sauvages Lyssou*, in *Bul. de la Soc. de Géo.*, July, 1875.)

Lister, SIR JOSEPH (b. 1827), a distinguished surgeon, whose studies on inflammation have produced the now universally used antiseptic treatment of wounds, etc., and the antiseptic method of operation, graduated at London University in arts (1847) and in medicine (1852). In the same year he became a fellow of the Royal College of Surgeons. He was then successively appointed assistant-surgeon and lecturer in Edinburgh, Regius Professor of Surgery in Glasgow, Professor of Clinical Surgery in Edinburgh, Professor of Clinical Surgery in King's College Hospital, London (1877), and eventually Surgeon Extraordinary to the Queen. Sir Joseph Lister holds many foreign orders, and has received the medal of the Royal Society (1880) and the prize of the Academy of Paris (1881). He holds several honorary degrees, and in 1883 was made a baronet.

Liszt, ABBÉ FRANZ (1811-86), a Hungarian pianist and composer, first appeared in public in his ninth year. He studied in Vienna and Paris, and produced an opera. In 1861 he took orders in Rome, and later in 1870 became director of the conservatory of music at Pesth. His compositions include the oratorios *St. Elizabeth* and *Christus*, and the *Faust* and *Dante* symphonies besides some very characteristic *Hungarian Rhapsodies*.

Litany (Greek, "supplication") originally denoted any form of prayer, but the name was afterwards confined to that used in times of special distress, when the people marched in procession through the streets, exclaiming repeatedly, "Lord, have mercy upon us! Christ, have mercy upon us!" The litany, as its name implies, was of Eastern origin. Towards the end of the 5th century it was adopted in Gaul, and from Gaul the litany passed to Rome at the close of the 6th century in the pontificate of Gregory the Great, who divided the citizens into seven classes, appointing a separate procession and litany for each class. This service is called the "Great Litany of St. Mark," because it was held on St. Mark's Day. In course of time numerous invocations to the Virgin, apostles, martyrs, and saints were introduced. When the litany was translated into English, during the Reformation, these were gradually eliminated, and the service assumed very much the same form that it has now. In the Church of Rome it is used on the Rogation Days, St. Mark's Day, and various other occasions. Its use on Sundays is peculiar to the Church of England.

Litchi, the fruit of *Nephelium Litchi*, a sap-indaceous tree, native to southern China. It is nearly round, $1\frac{1}{2}$ inches in diameter, reddish-brown, and warty, so as sometimes to be sold as Chinese strawberries. A white gelatinous pulp shrivels and blackens in drying, but remains sweet. Large quantities are eaten in China, and the demand for them is on the increase in England.

Litharge consists of the monoxide of lead, PbO, and is formed by heating lead in air. It has a yellow colour, and if melted and slowly cooled forms a fine crystalline mass. By more careful cooling crystals of the form of rhombic octahedra may be obtained. It also occurs native in some Mexican localities. It is largely employed in the manufacture of flint glass, as a glaze for earthenware, in the production of red-lead, white-lead, and of most of the lead compounds or preparations.

Lithic Acid is another name for uric acid. The condition in which there is an abnormal quantity of lithic acid in the blood, such as occurs in gouty subjects, is termed the *lithic acid diathesis*.

Lithium is a metallic element discovered in the mineral *petalite* at the beginning of the present century. The metal itself, however, was not isolated until 1855. It occurs in a few minerals such as *petalite*, *spodumene*, *triphyline*, but in small quantities it is present in most mineral and spring waters,

and occurs also in the ash of very many plants, *e.g.* vine, seaweeds, coffee, tobacco, etc. In its chemical deportment it closely resembles the alkali metals sodium and potassium, forming an alkaline hydroxide, LiHO . It differs from these, however, in forming an almost insoluble carbonate. It is a silver-white metal soft enough to mark paper. It may be drawn out into wire, and tarnishes if exposed to the air. It melts at 180° , and burns with a bright white light. It has the lowest atomic weight (7.1) of all the elements with the exception of hydrogen, and is remarkable as being the lightest solid known, possessing the specific gravity of .59. Even when present in very minute quantities it may be detected by means of a spectroscope, its spectrum showing two very characteristic lines, one in the yellow, the other in the red.

Lithofracteur is a sort of dynamite consisting of not more than 55 parts of nitro-glycerine mixed with 45 parts of a pulverised compound of one part of charcoal, bran, and sawdust, singly or in combination, $3\frac{1}{2}$ parts of kieselguhr, $2\frac{1}{2}$ parts of nitrate of baryta and bicarbonate of soda, or either of them, and $\frac{1}{2}$ part of sulphur and manganese, or either of them.

Lithography, the art of producing pictures or writing on stone in such a way that impressions may be taken from it in ink by a method similar to that employed in ordinary printing. Lithography was invented at Munich by Aloys Senefelder in 1796. The physical facts which render it possible are the adhesive character of greasy matter when brought into contact with calcareous stone, the mutual affinity of greasy substances and their antipathy to water, and the readiness with which water is absorbed by calcareous stone. The best stone for the purpose is composed of clay, lime, and siliceous earth, which is quarried at Solenhofen, in Bavaria. A clear grey colour is preferable to any other. The most important processes by which the design is produced are the following:—

(1) *By direct drawing.* The design may be executed either with a crayon or by applying ink with a pen or brush. The ingredients used in the preparation of the inks are lard, hard soap, shell-lac, white wax, carbonate of soda, Venetian turpentine, and Paris black. Chalk-drawing is the most artistic kind of lithography, but it is now almost entirely superseded by more convenient processes. The first step is to grind the stone with a little fine gravel sand and water, and to pumice it. A chalk drawing is first traced in outline with the crayon, and then tinted or shaded. When the drawing is complete, the stone is etched, the same means being employed in both processes. It consists in the application of a weak solution of nitric acid in gum-water, which removes the grease-oils from the stone, brings out the lines of the drawing, and lays bare the pores in the unmarked portions, so that they may more easily imbibe a solution of gum-arabic in water with which the stone is now flooded. When this has been removed, the printer “washes out” the picture

with turpentine, leaving only a faint white impression, but, though the ink has disappeared, the grease remains in the stone. A damp towel is now applied to the stone, and the inking-roller is passed over it, the greasy lines absorbing the ink, whilst the wetted and gummed surface remains free from it. An impression of the design is then taken on a piece of paper, which is passed through the printing-press.

(2) *Transfer from paper, or from another stone.* The design is executed in lithographic transfer ink on paper which has received a coating of isinglass, flake-white, and gamboge. The paper is then damped and pulled through a press with the coated side towards a heated stone. After this the paper is removed, whilst the ink remains adhering to the stone. The subsequent treatment is identical with that in the preceding process. Chalk drawings also are now usually executed in this manner, the design having been first of all drawn with lithographic chalks on paper to which a grain has been given by mechanical means.

(3) *Engraving on stone.* A thin coating of gum is placed on the surface of a polished stone, and coloured by rubbing in Paris black or some other pigment. The design is then cut through the gum on the stone by means of steel needles fixed in cane handles. The stone is next covered with oil or some other greasy matter, which passes into the incisions formed by the needles. The stone is afterwards treated in the same manner as in the processes already described, except that in place of a roller, an instrument called a “dabber” or “dauber” is used to rub the ink into the lines.

(4) *Chromo-lithography.* By this process coloured pictures are produced, a separate stone being used for each colour and tint required. Usually the whole outline is first drawn on, or transferred to a stone called the keystone, and from this again it is transferred to as many other stones as may be required, thus enabling the artist to determine the outline of each of the colours, and prevent them overlapping. The unnecessary lines can be easily removed in each case by the use of water. In one of the impressions taken from the key-stone the entire outline is retained, it is given a neutral grey tint, and is made the basis of the intended picture. There are various methods of “registering,” *i.e.* securing the exact correspondence of the outline on each of the stones.

(5) *Photo-lithography.* By this process it is possible to obtain copies of drawings executed in clear lines or dots. The drawing is photographed on glass, specially-constructed lenses being employed. The negative is inserted in a photographic printing-frame, and an impression is taken from it on a piece of sensitive transfer-paper, and thence transferred to a stone, after which the printing is effected in the manner already described.

Lithotomy, the operation of opening the bladder with a view to the removal of a stone.

Lithotrite, an explosive of Belgian origin, in form of fine grey powder, which is sometimes compressed into cartridges. It contains nitrate of

soda, saltpetre, sawdust, charcoal, picrate of ammonia, ferrocyanide of potassium, and sulphur.

Lithotrity, the operation of crushing a stone by means of a suitable instrument introduced into the bladder, and then washing out the fragments. Lithotrity has to a considerable extent superseded the far more ancient operation of lithotomy in the surgical treatment of stone in the bladder.

Lithuania, a region in the E. of Europe, which was a grand-duchy in the 11th century. In the 14th century it was united to Poland, and now belongs to Russia, comprising the governments of Mohilev, Vitepsk, Minsk, Vilna, and Grodno.

Lithuanians, an Aryan people, whose domain formerly comprised most of the Baltic provinces and extensive tracts in East Prussia and about the frontiers of Poland and Russia, but is now mainly restricted to the region enclosed by the Lower Dwina and Niemen rivers. They are interesting, especially to philologists, on account of the extremely archaic type of their Aryan speech, which is most akin to the Slav branch, but preserves many grammatical forms older than Greek or Latin and, in some instances, even than Sanskrit. Since the 10th century they have been divided into three distinct groups:—the *Bourssians* (Prussians), Germanised in the 17th century; the *Lettons* (Letts), of Courland and parts of Livonia, Esthonia, and Vitebsk, some of whom are also Germanised and others Russified; the *Lithuanians*, including the *Yonuds* (Samoyitians), of the lowlands, and the Lithuanians proper (*Litra*) of the uplands. Total population of Lithuanian speech (1883) over 3,200,000. Of the two surviving languages, Lithuanian proper is by far the more ancient, bearing somewhat the same relation to Lett that Latin does to Italian. Its preservation for thousands of years between the Slav and Teutonic domains enclosing it on the west, south, and east, is all the more inexplicable that it has never been cultivated as a literary language, and reduced to written form only in quite recent times. The culture received from the Germans and Poles never penetrated beyond the highest circles; and when the Lithuanians overran several Russian provinces in the 12th and 13th centuries, they adopted the Slav alphabet and composed all their chronicles in Russian. Even now nothing is printed in this ancient Aryan tongue except religious tracts and a single newspaper published in Prussia. After the annexation of Lithuania to Poland, on the extinction of the Jagellon dynasty (1572), most of the people became, and still remain, Roman Catholics; while others under analogous political influences became Lutherans or Orthodox Greeks; but all preserve reminiscences of pagan times, and the names of the old gods are still familiar to all classes. In other respects the Lithuanians are an extremely slow and stolid people; an unenterprising, almost spiritless, peasantry, formerly serfs, now little better than farm labourers; yet possessed of some intelligence, as shown by their rich unwritten literature, which abounds in national songs, idyllic and lyric poetry inspired by much tender sentiment

and love of nature. Since the 14th century Wilna (founded 1320) has been the chief centre of Lithuanian culture, such as it is. (Koeppen, *Der Litanische Volkstamm*, 1855.)

Litmus, a blue colouring-matter prepared in Holland from the archil-producing lichens *Roccelle* and *Lecanora*, with carbonate and sulphate of lime, as small blue cakes. It is almost exclusively used as a chemical test—a neutral aqueous solution staining bibulous paper violet, the least trace of free acid changing it to red, and free alkali changing it to blue.

Litre is a measure of volume in the metric system (q.v.). It is the volume of a cubic decimetre, and contains 1,000 cubic centimetres.

Littleton, or LYTTLETON, THOMAS (d. 1481), a most distinguished English judge, who was born at Frankley early in the fifteenth century. In 1455 he traversed the northern circuit as judge of assize, and in 1466 was one of the judges of Common Pleas. He was created a Knight of the Bath in 1475. His Anglo-French treatise on tenures is considered even now as the principal authority on real property in England. [COKE.]

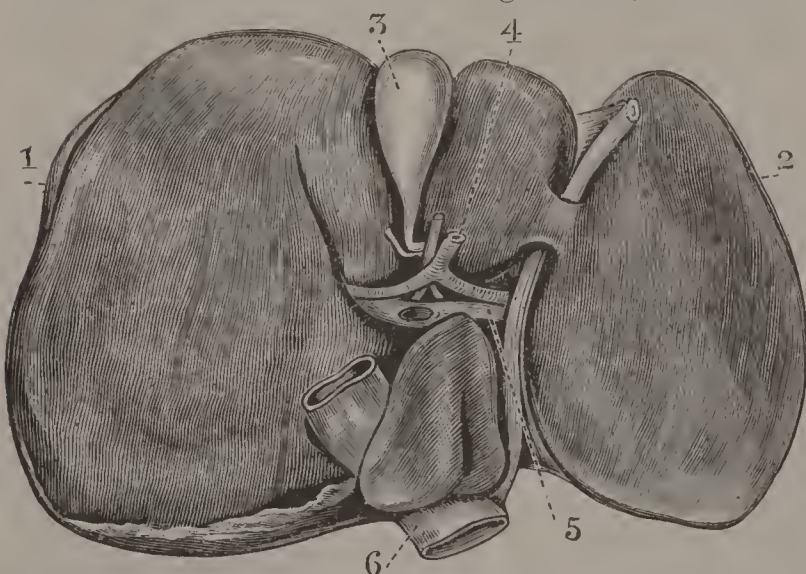
Littre, MAXIMILIEN PAUL EMILE (1801–81), a French lexicographer and philologist, was born at Paris. He was connected with the *National* and other journals, wrote a summary of Comte's philosophy and part of a *Literary History of France*. He was elected to the Academy in 1871, the date of the last volume of his magnificent *Dictionnaire de la Langue Française*, in which the plan of tracing the history of each word was first systematically and extensively carried out.

Liturgy, in strict ecclesiastical phraseology, denotes only the office used in the celebration of the Eucharist; but it is now used in a wider sense, so as to include every form of prayer, praise, and thanksgiving prescribed for use in public worship. In the ancient Athenian polity the richer citizens were required to defray the cost of maintaining the public games and other expenses of a similar kind. The classical term *leitourgia* used to denote these special services afterwards acquired a more general meaning, and was adopted in the Septuagint to express the worship which took place in the Temple. When the word came into use among Christians, its meaning was at first narrowed as explained above. Consequently, there are two kinds of liturgies, which require to be discussed separately. (1) It is probable that from the first there was some form of liturgy over and above the simple ritual ordained by Christ, and the different liturgies which subsequently arose were all developments of one original type. They fall into five groups—viz. three Eastern, the West Syrian, the East Syrian, and the Alexandrian; and two Western, the Hispano-Gallic and the Roman. A liturgy belonging to the Hispano-Gallic group was probably in use in the south of Britain before the arrival of Augustine, whilst in the Irish Church both the Gallican and the Roman rites were followed. The Roman liturgy can be traced back to the days of Innocent I., but did not assume its

final form till the period of Gregory the Great, under whom it was introduced into England by Augustine. The most ancient and solemn part of the liturgy is the "anaphora" or "canon," which began with the *Sursum Corda* and comprised the rest of the service, including the consecration of the elements; the preceding portion was termed the pro-anaphoral. The canon was identical in the "uses" of Sarum, York, Lincoln, and the various other English missals. The present Communion Service of the Church of England is based mainly on the Sarum Use, with some modifications. (2) The various services of the Roman Church, exclusive of those in the Missal, are contained in the Breviary (q.v.), the Manual (q.v.), and the Pontifical (q.v.). At the time of the Reformation some liturgy or fixed form of public prayer was adopted by each of the Lutheran and Calvinist Churches. On the Continent, however, more opening was usually left for free prayer than was the case in England, where the Book of Common Prayer was rigidly enforced on all congregations. [PRAYER-BOOK.] The severity of the Anglican system was extremely distasteful to the Puritans, and fostered amongst them a dislike to set forms of worship which has always prevailed in Nonconformist bodies.

Liutprand, LUITPRAND, LIUDPRAND (922-72), an Italian historian and prelate, was born in Pavia. In 931 he became page to Hugo, King of Lombardy, and then Chancellor to Berengarius II., Hugo's successor. Falling into disgrace, however, he took service under Otto of Germany (who became King of Lombardy, 951), and was made Bishop of Cremona. He was frequently employed as an ambassador. His works include a *History of Otto*, and *Antipodosis*, a history of Europe in six books from 886 to 950.

Liver. The liver lies in the upper part of the cavity of the abdomen immediately beneath the diaphragm. Its large lobe is situated in relation with the lower ribs on the right side, while the



THE LIVER : ITS INFERIOR SURFACE (TURNED UPWARDS).

1 Right lobe ; 2 left lobe ; 3 gall-bladder ; 4 hepatic artery ; 5 portal vein ; 6 vena cava.

smaller left lobe extends beyond the middle line of the body into the left hypochondriac region. The liver is the largest gland in the body, and weighs about 50 ounces in the adult. In addition to the

right and left lobes already alluded to, and lying between them, are three smaller lobes known as the *lobulus caudatus*, the *lobulus quadratus* and the *lobulus Spigelii*. The liver is held in its place by ligaments, and at the transverse fissure on its under surface there are situated the *hepatic artery* (which conveys fresh arterial blood to the liver), the *portal vein* (which transmits the blood charged with substances absorbed from the digestive tract), and the *hepatic duct* (which conveys the bile secreted by the liver and destined to be passed into the intestine and to aid in the processes of digestion). The branches of the three vessels just alluded to course together through the substance of the liver, being surrounded by an investment of connective tissue. The liver substance is divided into innumerable lobules, and the arrangement of the branches of the portal vein in respect to these lobules is peculiar. The smaller ramifications into which the portal vein subdivides run between the several lobules, and are hence spoken of as *interlobular veins*. These interlobular veins give off a network of capillaries converging from all sides of the lobule towards its centre, where the blood is collected into what is known as an *intra-lobular vein*. The intralobular veins unite with one another to form what are called *sub-lobular veins*, and these discharge themselves into the hepatic veins, which finally convey the blood into the vena cava inferior, and so to the heart. The branches of the hepatic artery distribute blood to the connective tissue framework of the liver, and to the ducts and blood-vessels and other parts of the gland, and the fluid conveyed by them ultimately finds its way into the hepatic veins. The liver contains a mass of cells, many-sided epithelial cells (polyhedral cells), which enter into the composition of the several lobules, and between which the capillary network already alluded to is disposed. It is the function of these cells to secrete certain materials from the blood contained in the neighbouring capillaries, and among other things to elaborate from the materials so secreted the bile, which is then transmitted to the ultimate branches of the hepatic duct, collected together by the system of ramifications of that duct, and conveyed either for storage in the gall bladder, or directly through the common bile duct into the duodenum. [For the composition of the bile and its action in aiding digestion see BILE.] In addition to its bile-forming function, the liver plays an important part in modifying the composition of the blood which passes through it on its way to the hepatic veins : and in particular the liver cells elaborate from the blood and store up for future use in the animal economy a substance known as *glycogen*. This glycogenic function of the liver was discovered by Claude Bernard, who showed that some of the food stuffs, absorbed from the digestive tract and conveyed by the portal vein to the liver in a soluble form, were abstracted from the portal blood by the activity of the liver cells, and stored up in them in the form of a substance known as *animal starch* or glycogen. This glycogen is subsequently again transmitted to the blood in the form of a soluble sugar in accordance with the needs of the body.

Diseases of the Liver. The liver is commonly credited with being the cause of innumerable disorders, and the complexity of the changes which occur in the gland is such as to render any disturbance in the normal conduct of the operations of the liver of extreme importance. [BILIOUSNESS, JAUNDICE, CALCULUS, CIRRHOSIS.] Abscess of the liver is sometimes met with in those who have lived in tropical climates, and it appears to be in some way associated with dysentery. Certain degenerations of the substance of the liver are described; the *amyloid* or *lardaceous* degeneration is one of these; fatty degeneration also occurs, and often in association with consumption. The liver

embryo becomes a sac-like body (sporocyst), which gives rise within itself to numerous Rediæ, a form differing much from the adult. These Rediæ may produce other generations like themselves, or may give rise to the next stage, the Cercaria. This is more like the adult, as it already possesses suckers, but differs from it in the presence of a powerful swimming tail, by means of which, having now bored its way out of the snail, it moves rapidly about in the water. After a time it creeps up a blade of grass and forms a kind of little cocoon: this being eaten by a sheep, the covering is digested, and the freed larva bores its way into the animal's liver and there becomes sexually mature.



LIME STREET, LIVERPOOL.

J. Valentine & Sons, Dundee, phot.

undergoes a peculiar change as the result of interference with the circulation in certain forms of heart disease, what is known as the "nutmeg liver" being produced. New growth is by no means uncommon in the liver, but is usually secondary to the appearance of cancerous formation elsewhere. Hydatid cysts (q.v.) are sometimes met with in the liver.

Liver-flukes (*Distomidæ*), a group of parasitic worms, the best known of which causes "rot" in sheep. The life-history is very complex, as the animal passes different periods of its life in different hosts. The adult form inhabits the bile ducts of various domestic animals, most commonly the sheep. The eggs produced by the adults pass out of the body of the host, and when they happen to get into a pool of fresh water give rise to a small free-swimming embryo, which makes its way into the body of a pond-snail (*Lymnæus*). There the

Liver of Sulphur, a mixture of sulpho-compounds of potassium, chiefly sulphides, formed by heating together potassium carbonate and sulphur in a closed crucible. The resulting mass is of a liver colour, and was known to the alchemists and used by them as a medicinal preparation. It is still employed as such, being known in the Pharmacopœia as potassa sulphurata.

Liverpool, the second seaport in the kingdom, an episcopal city (since 1880), and a parliamentary and municipal borough. It stands on the river Mersey, four miles from the sea and 185 miles N.W. of London. It has some magnificent public buildings, among which are the town-hall, the municipal offices (built at a cost of £160,000), the revenue building, the St. George's Hall, the exchange, the public library and museum, built by Sir William Brown at a cost of £30,000, an art-gallery (costing the same), given by Sir Andrew Barclay, the Picton

reading-room, the Government offices, and the law courts. It is well off as regards education, as it contains University College, Liverpool College, the Royal Institute, School of Art and Gallery of Art. It has numerous parks, the largest being Sefton Park (400 acres). The water supply is derived from two sources, from Bolton and Blackburn, and also from Vyrnwy in Wales. Liverpool possesses extensive docks, and an enormous landing-stage which rises and falls with the tide. Since Elizabeth's reign Liverpool has advanced in importance to an enormous extent, mainly owing to the vast expansion of communication with America.

Liverpool, ROBERT BANKS JENKINSON, EARL OF (1770-1828), entered Parliament under Pitt in 1790, and in 1796, on his father receiving a peerage, became Lord Hawkesbury. As Foreign Secretary he negotiated the Treaty of Amiens, and became Home Secretary in 1804. He was Premier (1812-27), but his prosecution of Queen Caroline made him extremely unpopular.

Liverworts, or HEPATICÆ, so-called from the form of the thalloid stems of some of the commoner genera (see Figs. on p. 151 in vol. ii.), form the lower class of the sub-kingdom Bryophyta (q.v.). Their vegetative structure is either *frondose* or *thalloïd* (as in *Marchantia*), or *foliose* (as in *Jungermannia*). The thallus may be homogeneous, but is generally distinctly dorsiventral, the upper surface bearing curious stomata (q.v.), and the lower surface having root hairs and minute leaf-scales. The foliose forms are also dorsiventral, as though the stem is cylindric and ascending. It bears its leaves in two dorsiventral rows, sometimes with a third under row known as *amphigastria*, and it is the lower surface which roots. The leaves are but one cell thick, and have no veins. Most species can reproduce themselves by asexual gemmæ, which are sometimes borne on the thallus in cup-like receptacles. Liverworts have also a sexual reproductive system. The antheridia are variously situated, but are always spheroidal, stalked, and enclosed by one layer of cells. They emit crowds of mother-cells of the antherozoids, and these last are clavate, spiral and bi-ciliate. The archegonia are surrounded by modified terminal leaves (the *involucre*) and by a tubular "perianth." They burst near their apex to form the *calyptra*, and the *capsule* (*sporophore*), which has originated from the fertilised germ-cell, generally divides into four valves. It bursts in many cases owing to the hygroscopic action of elongated cells with a double spiral filament in them which are known as *elaters* and are mixed with the spores. There is no character of universal application to separate them from mosses (q.v.). Liverworts occur in moist situations all the world over, but have no economic applications.

Livingstone, DAVID (1813-73), famous missionary and African traveller, was born at Blantyre, Lanarkshire, and worked there in a mill till, having learnt Latin and attended Greek and medical classes, he became a licentiate of the Faculty of Physicians and Surgeons of Glasgow. In 1840, under the auspices of the London Missionary

Society, he went to South Africa, and there joined Robert Moffat, his future father-in-law. His first post was in the Bechuana territory. He then travelled and discovered the valley of Zouga and Lake Ngami, visiting Linyanti and the river Zambesi. Then followed various minor explorations till 1865, when he started to try and find the source of the Nile, discovering Lakes Bangweolo and Moero and the Upper Congo. For three years no news came, and then it was told that H. M. Stanley had met and helped him at Ujiji on Lake Tanganyika. He died at Bangweolo on May 1, and was carried to the coast, preserved in salt, by his followers. He is buried in Westminster Abbey.

Livonia, or RIGA, a Russian government, with an area of 17,609 square miles, including the island of Oesel in the Baltic. It yields large supplies of timber and oats.

Livonians, the primitive inhabitants of Courland and of Livonia, to which they give their name. Their language and usages show that they are closely related to their eastern neighbours, the Esthonians, who are of Finnish stock and speech. Nearly all, however, are now absorbed in the surrounding German and Lithuanian populations, and at present the Livonian language is spoken only by about 2,400 persons occupying a few hamlets at the north-west extremity of Courland. In Livonia it appears to have died out about the middle of the present century.

Livy (B.C. 59-A.D. 17), the English form of TITUS LIVIUS, a celebrated Latin historian, born at Patavium (Padua), where he died after spending most of his life in Rome at the court of Augustus, his patron and friend. Out of the 142 books of his *Annales*, or *History of Rome*, only 35 remain. His style, despite a certain provincialism or "Patavinitas," detected in it by ancient critics, is now regarded as faultless, but he is often inaccurate.

Lixiviation is the term applied to the process whereby soluble matter is extracted from a mixture with insoluble material by water or other liquid. On the large scale many mechanical devices are employed in order to complete the separation with the use of as little water as possible.

Lizards (*Lacertilia*), an order of reptiles very widely distributed between lat. 60° N. (above which they are rarely met with) and the south of Patagonia, but most abundant, and in the highest development, between the tropics. The body is more or less elongated, and generally terminates in a tapering tail; the skin may be covered with scales, scutes, granules, tubercles, or spines. Four limbs are generally present, but either pair may be absent, or both may be reduced to rudiments and hidden beneath the skin. The cloacal aperture is transverse, and the male organ double. The teeth are attached to the jaw, and may be fused to the inner side (*pleurodont*), or set on the edge (*acrodont*). Most of them are oviparous; but in a few the eggs are hatched within the body of the parent, as in the Viviparous Lizard and the Blindworm (q.v.). There are about 20 families, with some

1,600 species. They vary in size from 6 feet to a few inches, and differ as widely in habit. Most are terrestrial, some are arboreal, a few burrow, and one form (*Amblyrhynchus cristatus*) from South America is certainly marine, as is probably Simony's Lizard (*Lacerta simonyi*) from Ferro. The majority feed on small vertebrates and insects, but some are vegetable feeders. Only one is poisonous [HELODERM], but the power of the Horned Toad (q.v.) to eject an acrid red spittle is well established. There are four British lizards, *Lacerta vivipara*, *L. agilis*, and *L. viridis* (from the Channel Islands), with four limbs, each with five digits, and the limbless Blindworm (q.v.). [AGAMIDÆ, AMPHISBÆNA, CHAMÆLEON, GECKO, HELODERM, IGUANA, MONITOR, SKINK.]

Llama (*Auchenia glama*), the American camel, probably descended from the guanaco (q.v.), and, like its namesake, known only in domestication. It stands about three feet high at the shoulders, and has coarse woolly hair, black, white, or a mixture of both. Till the Spanish conquest the Peruvians employed it as a beast of burden, especially in bringing down ore from the mountains, but its importance in that respect has greatly diminished since the introduction of horses, asses, and mules. The flesh of the young is eaten.

Llandovery Beds, a series of sandstones, conglomerates, and shales, well exposed in the neighbourhood of Llandovery, Carmarthenshire (whence they take their name), and covering a great part of South Wales and of the shores of Cardigan Bay. South-east of Bala Lake they rest unconformably on the Bala beds, and they form passage-beds from the Ordovician (q.v.), or Lower Silurian, to the Silurian proper, being divided into a Lower and Upper series by an unconformity. The Lower Llandovery series is about 1,000 feet thick, and the Upper about 1,500 feet. The latter is also known as the May Hill series from its occurrence at May Hill, Gloucestershire. The prevalence of the brachiopod genus *Pentamerus* throughout the two series has caused them to be sometimes termed the Pentamerus beds, *P. (strieklandinia) lens* being the characteristic species of the Lower, *P. oblongus* together with *Strophomena*, *Atrypa reticularis* (the earliest known echinoid), *Palæchinus*, and many trilobites, including *Calymene Blumenbachii* of the Upper series. The quartz-rock of the Lickey Hills, Worcestershire, is of Upper Llandovery age.

Llandudno, a watering-place in Carnarvonshire, Wales, standing under Great Orme's Head on the north side of the peninsula between Orme's Bay and the estuary of Conway. It has fine scenery, a pier, and good sea-bathing.

Llorente, JUAN ANTONIO (1756–1823), a Spanish historian, educated at Tarragona, was ordained priest in 1779, became vicar-general of Calahorra (1781), and chief secretary to the Inquisition (1791). After the suppression of the Inquisition he published (1817) his *Critical History of the Inquisition in Spain*. On the return of Ferdinand he was exiled, and lived in England and in Paris,

where he published (1822) his *Portraits Politiques des Papes*, which caused his exile from France.

"Lloyd's," an incorporated association of underwriters, or persons who, for consideration, guarantee the risk of loss of shipping and cargoes, etc. It takes its name from a coffee-house which, about 1688, was kept by Edward Lloyd in Tower Street, and was a notable resort of London merchants. Lloyd removed in 1691 to the corner of Abchurch Lane and Lombard Street, and soon made his house the headquarters of the shipping business. "Lloyd's" now occupies part of the first floor of the Royal Exchange, Cornhill, and the present association dates from 1771. It was incorporated by Act of Parliament in 1871. To assist its operations it has agents at all the large commercial ports in the world, and it supports a daily paper, *Lloyd's List*. A distinct but allied association also issues annually *Lloyd's Register*, which contains particulars, accumulated by Lloyd's agents and surveyors, of every ship in existence of upwards of 100 tons' measurement. It publishes, in addition, a *Yacht Register*. For insurance purposes, Lloyd's through a sub-committee classifies ships and assigns them a character which regulates the conditions of insurance. The soundness and seaworthiness of the vessel herself are indicated by a letter, the efficiency of her equipment by a number, and to the letter and number may be added the length of time for which the classification is expected to hold good. The letters used are A, A (red), Æ, and E. Numbers prefixed to letters are for purposes of comparison only, 100, for example, being better than 90.

Loach, any fish of the group Cobitidina of the Carp family (*Cyprinidæ*). There are six, or more, barbels; the dorsal fin is short or moderate, and the air-bladder partly or wholly enclosed in a bony capsule. The best known forms are *Misgurnus fossilis*, the Thunder-fish from stagnant waters of Germany and northern Asia; *Nemachilus barbatulus*, the common Loach of Britain and the Continent; and *Cobitis taenia*, the Groundling.

Load-line, the proper line of flotation for a ship proceeding to sea, or, more particularly, a line marking the extreme degree of immersion allowed to a vessel by the Board of Trade. This is indicated in British merchant vessels by the "Plimsoll Mark," a white circle traversed by a white horizontal bar, which is painted on every such ship's side.

Loam, an earthy rock composed of clay and sand neither of which amounts to 75 per cent. of the whole. It is commonly yellow, brown, or red from iron oxide, and occurs most frequently as the result of river-floods over alluvial meadows. From one of its chief uses it is known as *brick-carth*. When sandy—i.e. containing 60 to 70 per cent. of sand—it is added to stiff clays to lighten them, a process erroneously termed "marling," and thus some loams, such as those of the Upper Trias or Keuper, have been misnamed Marl (q.v.). Whether natural or artificial, most ordinary garden soil is a loam with a greater or less admixture of vegetable matter or humus (q.v.).

Loan is a species of contract analogous to bailment, but differing in this respect: that its subject is not to be redelivered to the lender or disposed of according to his direction, but is to be applied to the use and convenience of the borrower, he yielding to the lender afterwards an equal sum by way of repayment, in addition to which there is frequently an increase by way of compensation for the use of the sum advanced, which is known as *interest*, but when taken to an improper amount was denominated *usury*. In former times it was considered by many good and learned men that all increase by way of interest was against conscience, and there were laws in this country prohibiting an excessive interest, known as the "usury laws," which existed for a considerable period, the maximum rate being reduced to 5 per cent. by a statute passed in the reign of Queen Anne. During the course of the present and the preceding reign many statutes were passed progressively mitigating or narrowing the operation of the usury laws in deference to the new opinions gradually gaining ground regarding the interest on money. Under the influence of these views the total abandonment of all restrictions upon the rate of interest was at length resolved upon by the legislature, and was carried into effect by the Statute 17 and 18 Victoria, c. 90, which repealed all then existing Acts against usury. Where nothing but personal security is relied upon the usual documents evidencing a loan are a bill of exchange, promissory note, or I.O.U. [BAILMENT.]

Lobelia (named from Matthias de Lobel, a Flemish botanist, born in 1538, who passed most of his life in London and died at Highgate in 1616) is a considerable genus of herbs forming the type of an order, Lobeliaceæ, allied to the bell-flower tribe. They have an acrid narcotic latex; scattered exstipulate leaves; a superior, five-lobed calyx; a bi-labiate corolla, generally brightly coloured, white, blue, or scarlet; five epigynous stamens, with their anthers united round the style; a capsular fruit and albuminous seeds. Two species, *L. Dortmanna* and *L. urens*, are rare British plants; but they are most numerous in tropical and sub-tropical America. *L. Erinus*, trailing, with blue flowers; *L. cardinalis*, erect and scarlet-flowered; and others are garden favourites. *L. inflata*, "Indian tobacco," a North American species, in small doses is a useful expectorant in asthma; but in larger doses it is emetic or even poisonous.

Lobster, a Crustacean belonging to the order Thoracostraca. The Common Lobster (*Homarus vulgaris*) is caught in immense numbers round our coasts, where it is most commonly found on a rocky bottom. The young when just hatched differ very considerably from the parent, and it is only after having cast their shell several times that they become adult. The Spiny Lobster (*Palinurus*) and the Norway Lobster (*Nephrops*) are other common forms.

Local Action in electric batteries is caused by the presence in plates of commercial zinc of impurities in the form of small particles of metals

electro-negative to zinc, such as iron. These particles, when in the exciting fluid, form short-circuited voltaic couples with the zinc, and produce rapid waste. The action does not occur with pure zinc, and can be to a large extent obviated by amalgamating the surface of commercial zinc with mercury.

Local Government Acts and Board.

Numerous statutes have been passed during the present reign, giving to certain districts the power of adopting and carrying into effect the provisions of the Public Health Act, without the necessity of a provisional order of the former General Board of Health confirmed by Act of Parliament; and by a statute passed in the year 1871, the Local Government Board was constituted for the purpose of concentrating in one department of the Government the supervision of the laws relating to the public health, the relief of the poor, and local government. This Board may be said to have the control of the various local authorities entrusted with the execution of these laws in their respective districts, and its sanction is necessary for many purposes, *e.g.* the borrowing of money by sanitary authorities under the Public Health Acts. The Local Government Act, 1888, established County Councils throughout England and Wales. [COUNTY COUNCILS.]

Local Option, the power of regulating the liquor traffic with which the "Temperance" party desire to invest the inhabitants of each locality. It is usually proposed that the continuance or abolition of the traffic should be decided by a two-thirds majority of the ratepayers. The "Permissive Bill," embodying this proposal, was first introduced into Parliament in 1864; but the Liquor Traffic (Local Control) Bill, 1893, was the first instance of its inclusion in the Ministerial programme.

Lochleven, a lake, about ten miles round, in the county of Kinross, Scotland, contains four islands, on one of which was a priory, and on another are the remains of Lochleven Castle, famous as the prison of Mary Stuart after she had been taken prisoner at the battle of Carberry Hill.

Locke, JOHN (1632-1704), one of the greatest English metaphysicians, and the establisher of the empirical system of moral philosophy, was born at Wrington, in Somersetshire, and educated at Westminster and Christ Church, Oxford. In 1658 he took up the study of physic, and in 1666 became physician to Lord Ashley (the first Earl of Shaftesbury), in whose house he took up his residence, and who enabled and induced him to devote himself to politics and philosophy. Eventually his patron made him secretary to the Board of Trade, but he lost the appointment in 1674, and resided in France for his health from 1675 to 1679. In 1682 he accompanied the exiled Shaftesbury to Holland, and, falling under the suspicion of disloyalty, was deprived of his studentship in Christ Church by King Charles. After Monmouth's rising his person was demanded by King James's envoy at the Hague, so that he had to spend a year in hiding (1685-86),

when he wrote his first *Letter concerning Toleration*. At the Revolution he returned to England, and was made a Commissioner of Appeals. His celebrated *Essay concerning Human Understanding*, which had been in preparation for nearly twenty years, was published in 1690, when he also produced his second *Letter on Toleration* and his two *Treatises on Government* (one attacking Filmer (q.v.), the other adapting the Social Contract theory to justify the English revolution), in opposition to the doctrines of passive obedience. In the next year he wrote on finance; in 1692 he issued his third *Letter on Toleration*; in 1693 his *Thoughts concerning Education*. He was made a Commissioner of Trade and Plantations in 1695, which post he held until failing health, caused by asthma, induced him to retire. His latest works were the *Reasonableness of Christianity*, *Two Vindications* against the attacks of Dr. Edwards, who had charged him with Socinianism, and his controversial writings in answer to Dr. Stillingfleet's animadversions on the *Essay concerning Human Understanding*. In his great work he studied the origin of ideas and mental operations and affections by careful analysis of his own consciousness, with the result that he derived all knowledge from experience. Considering that a loose and inaccurate use of words was one of the main sources of error, Locke aimed with considerable success at being simple and clear in his style, and at investing with distinctness the notions with which he dealt; so that (in spite of a tendency to diffuseness) he exercised a great and beneficial influence on literary style, as well as on mental and moral philosophy. The declining portion of his life was solaced by the friendship of Lady Masham, the daughter of his intimate friend, Dr. Cudworth (q.v.).

Locker, WILLIAM, naval officer, was born in 1731, and entered the navy in 1746. He was made commander in 1762, and captain in 1768; and while commanding the *Lowestoft* in the West Indies he had as one of his lieutenants Nelson. After much further service he hoisted a broad-pennant in 1792 as commander-in-chief at the Nore, but early in the year following received the more congenial appointment of Lieutenant-Governor of Greenwich Hospital. There he died at the end of 1800.

Lockhart, JOHN GIBSON (1794-1854), a talented author and novelist, was born at Glasgow, and in 1809, when a student at Glasgow University, he gained an exhibition to Balliol College, Oxford. On leaving Oxford Lockhart went abroad, and on his return became a member of the Scottish bar; but he spent most of his time in writing. In conjunction with Professor Wilson (q.v.) he established *Blackwood's Magazine*. In 1820 he married the eldest daughter of Sir Walter Scott. He was editor of the *Quarterly Review* 1826-53. His works include *Spanish Ballads*, *Valerius*, *Reginald Dalton*, *Adam Blair*, and, above all, his *Life of Sir Walter Scott*. In 1843 he received the post of auditor to the Duchy of Lancaster, worth about £400. His granddaughter is the only lineal descendant of Sir Walter Scott.

Lock Jaw. [TETANUS.]

Locks in canals and rivers are used for raising or lowering vessels from low to high level water, or *vice versâ*. At the place where, owing to the presence of a weir or otherwise, the level of the water changes, a sufficient length of the river or canal bed is provided with a gate at each end, opening in such a direction that the pressure of the water tends to keep them closed. The gates are provided with sluices, or openings which may be closed by slides. When the lock is full the upper gates can be opened to admit vessels; the gates being closed, water is allowed to escape through the sluices until that in the lock reaches the lower outside level; the lower gates can then be opened to allow vessels to go out, or those coming up stream to enter. The lock is then refilled by closing the lower gates and opening the sluices in the upper ones.

Lockyer, JOSEPH NORMAN, F.R.S., born at Rugby in 1836, entered the War Office in 1857, became astronomical lecturer at South Kensington, and directed the eclipse expedition to Sicily 1870, and to India 1871. He is specially distinguished for his work in spectrum analysis. He has published *Studies in Spectrum Analysis* (1872), *Solar Physics* (1874), *Star-gazing* (1877), *Chemistry of the Sun* (1887), and is the editor of *Nature*.

Locomotive. The form of steam engine best adapted for actual locomotion is not the most efficient from the point of view of the economy of coal. The whole machinery, including furnace, boiler, and engines, must be compressed into small space, and must be arranged so that high speeds shall not endanger its stability. The ordinary type of locomotive has not altered much in general appearance since the general adoption of the "narrow" gauge for railways. The boiler is cylindrical and multitubular, of wrought-iron or steel, terminated at one end by the fire-box and at the other end by the smoke-box. The fire-box is of rectangular section, and holds the grate. It is made of copper, and is so arranged that the water of the boiler can circulate round a considerable portion of its surface. To support the great pressure that this incurs, the box is heavily stayed with ribs at its crown, the copper tubes acting as stays for the front. The chimney is short, and leads direct from the smoke-box. The steam cylinders are arranged in the front either underneath the fire-box or else at each side. The compound-cylinder principle has been successfully employed with locomotives, but is not yet general. The steam pipe gathers steam from near the top of a dome, where the steam is fairly dry; it passes down to the cylinders and ultimately to the exhaust in the smoke-box. The exhaust steam blows out in jets, which force a draught through the furnace and thus compensate for the shortness of the chimney. The slide-valves are regulated by a link motion (q.v.), which serves as a reversing gear. The power of the engine is also modified by a regulator valve in the steam pipe worked by hand, as is also the link motion. Goods engines used for heavy traffic have the

driving-wheels coupled up with two other pairs to avoid slipping on the rails. They are adapted for slow motion, and the driving-wheels are small. Passenger engines have large driving-wheels, and may have another pair of wheels coupled on. Driving-wheels vary in diameter from about five to seven feet. The *tender* carries fuel and water, and is also constructed with the most powerful brake on the train. [STEAM-ENGINE.]

Locomotor Ataxia, TABES DORSALIS, is a term applied to a disease one of the most characteristic symptoms of which is an ataxia or disorder of locomotion. The patient's gait somewhat resembles that of a drunken man; he raises his feet unduly high and brings them down to the ground with peculiar suddenness. He is unsteady, and sometimes is unable to maintain the standing posture when his eyes are closed. The legs are especially involved in this disease, but the arms may be affected, and sensation as well as movement may be implicated. Peculiar darting pains in the limbs are of frequent occurrence, and to them the term lightning pains has been applied. Pain in the region of the stomach with gastric symptoms (gastric crises) constitute another characteristic group of phenomena. Other symptoms are loss of "knee-jerk," affection of the joints, and a peculiar condition of the pupil of the eye, the aperture of the pupil becoming smaller when the stimulus of exposure to light is applied, but the normal contraction when the vision is accommodated for near objects not being observed (Argyll Robertson phenomenon). In some instances there is atrophy of the optic nerve with loss of sight. The disease begins in middle life, and runs a very protracted course. It is more common in men than in women. It is caused by a process of degeneration or sclerosis affecting the posterior columns of the spinal cord. In some instances it occurs in persons who have previously been the subjects of syphilis, and in them treatment by appropriate remedies may be productive of considerable benefit.

Locri, a Grecian people found on the Ægean coast opposite Eubœa (Locri Opuntii) and between Phocis and Ætolia (Locri Ozolæ). The former founded (B.C. 683) the colony of Locri Epizephyrii, a city of Lower Italy, now Gerace, north of the promontory of Zephyrium.

Locusts, a group of Orthoptera (q.v.) forming the family *Locustidae*, though many insects belonging to other groups are often included under this term: thus many of the so-called locusts of Australia and America really belong to the Cicadas. The locusts live on vegetation, and, as they occur in enormous hordes, they do serious damage in countries where they occur. They are also large in size, and include some of the bulkiest of known insects. Some of the largest live in America; but, as they do not occur in such numbers, do not do nearly as much damage as the smaller brown locusts of Asia, Africa, and the south of Europe, which measure only about five inches in expanse of wing. When an army of locusts is on the march they go straight forward, devouring everything along the line, and often completely

devastate whole districts. They can be kept in check owing to the fact that they always travel in a straight line, and cannot fly well; a comparatively low obstacle thus checks their progress. In Cyprus they used to do enormous damage to the crops, but since the British occupation have been almost exterminated by a system of pits and fences. A long zigzag wire fence is placed across their line of march, pits are dug at each of the inner angles, the locusts cannot jump the fence, but work along the faces of the angles and fall into the pits. True locusts do not occur in England except very rarely, when they have escaped from ships, etc. In the 18th century, however, a large number reached England, while Europe was overrun by vast hordes.

Locust-Tree (*Robinia Pseud-acacia*), the False Acacia, is a leguminous tree, reaching 50 or 80 feet in height, native of the United States. Its roots have the smell and taste of liquorice, but are poisonous. Its wood is yellowish, but when only five years old turns brown at the heart, and is hard and durable. The bark is deeply furrowed, and comes away in strips. The leaves are deciduous and imparipinnate, with spinous stipules, and the flowers are in pendulous racemes of white papilionaceous blossoms. The wood is useful for posts and tree-nails, but splinters. It was extravagantly belauded by William Cobbett (q.v.). The fruit of another leguminous tree, *Ceratonia Siliqua*, is known as Locust-beans. [CAROB.]

Lode. [MINERAL VEINS.]

Lodestone, or MAGNETITE, is an oxide of iron having the composition Fe_3O_4 . The name is derived from its use as a compass or "leading-stone" by mariners. It is frequently, but not always, found in a magnetised condition, and was once regarded as an object of great and mysterious interest. [MAGNETITE.]

Lodge, THOMAS (1556-1625), romance-writer and poet, born in Lincolnshire of a respectable family, went to Trinity College, Oxford, as a servitor. After leaving college he became a law-student at Lincoln's Inn, but took part in two naval expeditions, on the first of which he wrote the euphuistic romance of *Rosalynde*, on which Shakespeare based his *As You Like It*. He wrote a tragedy, *The Wounds of Civil War* (1594), and in conjunction with Greene a satirical mystery-play called *A Looking-Glass for London and England*. His earliest work was *A Defence of Stage Plays, in Three Divisions* (1580), which was answered by Gosson. Lodge wrote several sonnets, satirical poems, and pastoral tales. He eventually became a physician, and practised in London, especially amongst Roman Catholics. He died of the plague.

Lodgings. Lodgings are part of a house, and may be let and taken in the same manner as lands and tenements. Usually, however, they are let either by written agreement or verbally, and are either furnished or unfurnished. A written agreement is often desirable to avoid dispute. Formerly a lodger's goods were liable to the rent of the

house, and could be distrained upon therefore even if the lodger's rent were duly paid; but by the Statute 34 & 35 Vict., c. 79, passed for the protection of lodgers' goods, it is provided that if any superior landlord shall levy a distress on any furniture, goods, or chattels of any lodger for arrears of rent due to the superior landlord by his immediate tenant, the lodger may serve the superior landlord, or the bailiff or other person employed by him to levy such distress, with a declaration in writing made by the lodger setting forth that the immediate tenant has no right or beneficial interest in the furniture, etc., so distrained, and that such furniture, etc., are the property or in the lawful possession of the lodger, and also setting forth whether any and what rent is due from the lodger to his immediate landlord, and the lodger may pay to the superior landlord that rent, if any, so due as last assessment, or so much thereof as shall be sufficient to discharge the claim of the superior landlord. And it is also enacted that any payment made by any lodger pursuant to the above provision shall be deemed a valid payment on account of any rent due from him to his immediate landlord. Compensation may be awarded up to £15 by a police magistrate for wilful damage done by lodgers.

Lodhi, an agricultural Hindu caste widespread throughout the Central Provinces, India; two branches, those originally from the Ganges and Jumna valleys, and the Raepore or Maher Lodhis; "fine, powerful men, living always in the open air, and following no profession but that of the plough." (A J. Lawrence, *Report on the Wyingunga*, p. 69.)

Loess, a loose, fine-grained rock, generally pale-coloured, composed of clay, sand, and occasionally lime, and containing a few land-shells and plant remains, but neither sea-shell nor pebble. It occurs over wide areas, especially on continents, independent of existing river-valleys, and is occasionally converted by a copious admixture of humus into rich "black lands," as in Siberia and Western Canada. The prairies between the Rocky and the Alleghany ranges seem to be composed of it, as are also perhaps the "pusztas" of Hungary and an immense area in China. The river Hoang-ho cuts terraced valleys in it to a depth of 1,000 feet, the sides of these valleys having been excavated into underground villages by a teeming population to avoid the extremes of heat and cold. The river gets its name (*hoang* meaning "yellow") from the abundance of fine sediment suspended in its waters, as does also the Yellow Sea (Hoang-hae), which receives this sediment. Loess would seem to be, at least mainly, accumulated by wind action.

Loewe, JOHANN CARL GOTTFRIED (1796-1869), a German composer, studied at Halle, and, having settled at Stellen, became musical director and organist to the city. He visited Norway, Sweden, and France, and sang and played in London (1847) before the English court. He composed sixteen oratorios, five operas (one performed), and numerous pianoforte pieces. His ballads, however, were his most important productions, many being very beautiful.

Lofoden, or LOFOTEN, the name of a chain of islands situated on the N.W. coast of Norway. The group includes the islands of East Vaay, West Vaay, Karstad, and Moskenias, and the islands of the Vesteroalen group are also usually included under this name. In the months of January and March shoals of cod-fish visit their waters, and many are caught. The chief export is cod-liver oil.

Log. 1. (Or LOG-BOOK.) A nautical diary, kept in proper form, of daily occurrences.

2. A device for ascertaining the rate of a ship's motion through the water. The common log, invented early in the 17th century, consists of a piece of board about a quarter of an inch thick, and shaped like the sector of a circle. This is fastened in a peculiar way so as to offer the greatest possible amount of resistance to the water, by means of two "legs," to a light line about 150 fathoms long. The line is wound on a reel at the stern of the ship, and, when the log is used, it is allowed to run freely overboard for a given period, which is measured with a log glass. The length is marked by knots at 50-ft. intervals. The number of knots that run out in half a minute are the number of "knots" (*i.e.* geographical miles) at which the ship is moving per hour. Many more scientific logs have lately been invented, but few give much better results than the common log when it is employed by experience and common-sense.

Logan, SIR WILLIAM EDMOND (1798-1875), Canadian geologist, born in Montreal, was for ten years in a London office. He then went to Wales, where his geological studies attracted attention. From 1843 to 1871 he was chief of the geological survey of Canada, and he also assisted in the survey of Britain. He was knighted in 1856, and received the Wollaston Medal of the London Geological Society. His writings appear in the reports of the Canadian survey, and the *Proceedings* of the British Association and of the Geological Society.

Logarithms. The definition of a logarithm is obtained from the equation $a^x = m$, where x is said to be the logarithm of m to the base a , or $x = \log_a m$. If $a^x = m$ and $a^y = n$, then $a^x \times a^y = a^{x+y} = mn$. [INDICES.] From definition, therefore, $x + y = \log_a mn$, and $\therefore \log_a mn = \log_a m + \log_a n$. Hence we see that the logarithm of the product of any numbers is equal to the sum of the logarithms of the numbers; and similarly it can be shown that the logarithm of a quotient is the logarithm of the numerator diminished by the logarithm of the denominator. Also $\log_a m^r = r \log_a m$, whether r be integral or fractional. The use of logarithms very much simplifies calculations, as multiplication is done by means of their addition, division by subtraction, and extraction of roots or raising to powers by their division or multiplication. For convenience in ordinary calculation, the base is taken as 10, and is generally not expressed; thus the equation $\log 12 = 1.07918$ means $\log_{10} 12 = 1.07918$. The integral part of the logarithm is called the *characteristic* and the decimal part the *mantissa*, and

with the base 10 all numbers containing the same figures, and only differing in the position of the decimal point, have the same mantissa. When the logarithm of a fractional number is required, the mantissa is still kept the same by writing a negative number for the characteristic; thus, $\log 1.2 = 0.07918$, $\log .12 = \overline{1}.07918$, $\log .0012 = \overline{3}.07918$. The negative sign is written over the characteristic, to indicate that it alone is negative, the mantissa remaining positive. The characteristic can be told by inspection. If the number is greater than 1, the characteristic is one less than the number of digits in the integral part. If the number is fractional, the characteristic is one more than the number of ciphers to the right of the decimal point. In tables of trigonometrical functions the logarithms are generally increased by 10, to avoid the use of negative characteristics. This is generally expressed by writing *L* instead of *log.*; *e.g.*

$$L \tan 28^\circ = 9.7257.$$

In order to change from a system of logarithms with one base *a*, to a system with another base *b*, we have the equation $\log_b m = \log_a m \times \frac{1}{\log_{ab}}$, the constant multiplier $\frac{1}{\log_{ab}}$ being called the *modulus* of the system with base *b*, with regard to the system with base *a*. In algebraical work logarithms to the base *e* are the ones which naturally occur—appearing in the Exponential Theorem—and hence in theoretical work the base *e* is always used—

$$e = 1 + \frac{1}{1} + \frac{1}{1.2} + \frac{1}{1.2.3} + \frac{1}{1.2.3.4} + \dots = 2.71828 \dots$$

The system of logarithms to the base *e* is known as the natural or hyperbolic system, and is due to Napier, while the common or decimal system was invented by Briggs.

Logic (Gk. *logos*, “reason,” “argument”) may be roughly defined as the study of the laws or forms of correct thinking. Since thought is at bottom the instrument of all knowledge, it soon became necessary to determine whether all conclusions of thought were equally correct. Logic, in other words, begins with the beginning of science. The problem as to what are the laws or forms to which correct thinking must conform presented itself at an early date to the Greeks and obtained a provisional solution from both Parmenides and Plato. With them, however, logic is not yet separated from general philosophy. Aristotle is the first to systematise logic, and to assign it a department of its own. The real question which Aristotle attempts to solve in his *Analytics* (the term *Logic* is due to Zeno the Stoic) is what are the *conditions of science*. Science exists as systematised knowledge. What presuppositions are necessary to explain its existence? And this question has remained the problem of logic for most succeeding thinkers. This aim of Aristotle’s logic was obscured in succeeding ages by the attention which was concentrated on the account which he gives of the formal laws of thought. The whole mechanism of

deductive logic, depending on the doctrine of syllogism (q.v.), was taken over by the schoolmen from Aristotle, and little attention was paid to the other parts of his logical system. This deductive logic was well suited to mediæval thought. Science in the modern sense did not exist, and all that was required of logic was to evolve the correct consequences of the propositions of the faith, which, according to the theory of the mediæval Church, were given by revelation. Hence the syllogistic logic did not lay down a method of arriving at knowledge, but merely analysed conceded general propositions, and rendered explicit what was implied in them. Bacon’s *Novum Organum* is a revolt against this deductive logic, and is, in the main, a return to the real views of Aristotle. Logic is to be the instrument of scientific discovery, and, as no general proposition can be taken for granted, it must be obtained by *experiment* in accordance with the new inductive method, which assembles a number of particular allied instances, and discovers the law which underlies them. Inductive logic, which begins with Bacon, is most fully worked out by J. S. Mill in his *System of Logic*. Since Bacon two principal views have obtained as to the office of logic. (1) There are the formal logicians (*e.g.* Hamilton, Mansel), who have rehabilitated the scholastic logic. Under the influence of Kant, Mansel elevates formal logic into a speculative science, which would exist and investigate the laws of unerring thought, even if all men were unerring thinkers. (*Cf.* for criticism, T. H. Green, *Works*, ii. 158.) (2) There are also other logicians who hold that logic is the science of the method of knowledge (*e.g.* J. S. Mill, Kuno, Fischer, Sigwart, Wundt). As to *what* the method of knowledge is, each inquirer will differ according to his view as to what the object of knowledge is; and this is a question for metaphysic to those who believe in metaphysic, and for psychology to those who, like Mill, believe that nothing is required to render reasoning possible but the senses and association. An exception must be claimed from both these two classes for Hegel, who, with his theory of the world as a process of thought from the abstract to the concrete, identifies logic with metaphysic.

[For the whole subject see Jevons’ *Elements of Logic*; for deduction, Mansel’s edition of *Aldrich*, Oxford (1862); for induction, Mill’s *System of Logic*. For an attempt to reduce logic to an algebraical notation see J. Venn, *Symbolic Logic* (1881); also see SYLLOGISM, INDUCTION, DEDUCTION.]

Logon, a large Negro nation of Central Sudan, whose territory lies about 40 miles S.E. of Lake Chad, between Bornu in the north and Musgu in the south; are akin to the Makaris of Bornu, but of darker colour and generally of more pronounced Negro features. They are fishers, agriculturists raising fine crops of cotton, tobacco, indigo, and sorghum, and are specially skilled in straw-plaiting—their mats, baskets, hanging doors, and other plaited objects being highly prized throughout Sudan. They have an organised system of government under a *Miarai* (“king”), who is tributary to the Sultan of Bornu, and who is required to consult

a council of five dignitaries in all affairs of importance.

Logwood, the wood of *Hæmatoxylon campechianum*, a leguminous tree with paripinnate leaves and racemes of yellow flowers, native to Yucatan and some other parts of Central America. The tree reaches 40 feet in height; but the deep red heart-wood, which is very hard and heavy, occurs in commerce in logs 3 feet long. These are cut into chips and ground, furnishing one of the best deep red and black dyes, owing to the presence of *hæmatoxylin*. It is used by calico-printers and cloth-dyers; by hatters for black hats; and in some inks. The tree is naturalised in Jamaica, whence 115,000 tons are exported annually. Our imports amount to 50,000 to 70,000 tons.

Lohâni (LAWÂNI), a large section of the Afghan Povindahs, with four divisions—Daolat, Pani, Mian, and Marwâti—and 64 minor groups. The term Lohâni, meaning "travellers," has reference to their periodical visits to India for trading purposes, and in this sense it is often applied to all the Povindah nation.

Lohengrin, a mythological hero of Germany, whose exploits are dealt with in a 13th-century poem edited by Rückert in 1857, and in Wagner's opera of *Lohengrin*. The son of Parzival, Lohengrin was a knight of the Grail, and was conveyed by a swan under King Arthur's orders to Mainz, where he rescued from an oppressor and married the Duke of Brabant's daughter Elsa, who was forbidden to search into his origin. After his return to Germany from an expedition with the Emperor against the Saracens and Hungarians, his wife questioned him on the forbidden topic. Her third attempt was successful; she gained the knowledge she sought, but lost her husband, who was carried away by the swan.

Lohita, a collective name of numerous hill tribes on the Burma-Assam frontiers; they are of Tibeto-Burmese stock, but present great diversities in their physical appearance, speech, usages, traditions, and grades of culture. Chief branches: Bodo (Borro), Garo, Changlo, Miri, Sing-pho, Mikir, Naga, Khyeng, Karen, Zabaing.

Loir. [DORMOUSE.]

Loir, RIVER, the ancient *Lidericus*, rises in the lagoon of Cernay and flows for a course of 150 miles through Eure-et-Loir, Loir-et-Cher, and Sarthe, joining the river of that name north of Angers.

Loire. 1. The ancient LIGER, the longest river in France, rises in the Cevennes, in the department of Ardèche, and has a course of 626 miles, first in a N. and N.W. direction through central France to Orleans, then S.W. to Tours, and then generally W. to the Bay of Biscay, receiving on the right bank, among other tributaries, the Nièvre and the Marne, and on the left the Allier, Cher, Indre, and Vienne. It has a drainage basin 45,000 square miles in extent, and approaching in the N.E. to within 6 miles of the Seine basin. The river is tidal as far as Nantes (35 miles), and is navigable for 550 miles; but, rising at a height of 4,500 feet, it is practically

a mountain stream, and is well-nigh unnavigable for six months in the year. Canals connect the river with the Seine, the Saône, and Brest.

2. A department of central France, containing 3 arrondissements, and formerly part of Lyonnais, takes its name from the Loire, which here flows through ravines and plains, which were the beds of ancient lakes. It is 78 miles long, 43 miles broad, and contains 1,838 square miles. In the west, the Forez Mountains separate the Loire and the Allier, and in the east the Rhone and Loire basins are separated by the hills of Lyonnais and by offshoots of the Cevennes. The Loire valley is unfruitful, but the department is rich in coal and iron, the St. Étienne coal-basin being the second in France. At St. Étienne, the capital, is a national arms factory, and here the heaviest steel castings are made for the navy. Much silk also and cotton are manufactured, as well as woollens, linen, glass, paper, and leather. About half of the department is arable, and produces wine, fruits, fodder, and potatoes. Timber and turf are obtained from the pine woods, and there are mineral springs at St. Galmier and elsewhere.

Loire, HAUTE, a department of central France, part of the old duchy of Auvergne and the county of Forez. It contains 1,915 square miles, and is crossed in the N. by the Loire, and N.W. by the Allier. Most of the department is in the Loire basin, and consists of a plateau deeply indented by river valleys, and having a cold climate by reason of its height and the winds from the Cevennes. Volcanic action is very apparent, especially in the mountain parts, which belong to the Cevennes, and rise in Mont Mézenc to a height of 5,700 feet. Lace-making is one of the principal industries, others being the manufacture of wool, cotton, flax, silk, gold, and silver. There is much agriculture, and coal and building-stone are worked. The capital is Le Puy.

Loire Inférieure, a maritime department of western France, containing 5 arrondissements, and forming part of old Brittany, and Retz on the left bank of the Loire. It has a coast-line of 78 miles, and contains 2,600 square miles. The Loire traverses the west and forms an estuary, and the Vilaine is part of the N.W. boundary. The surface is flat and fertile, and is much intersected by canals, while salt marshes occur on the coast. The Lake of Grandlieu in the south contains 26 square miles. There are oak and pine forests, and granite, slate, and limestone are quarried. The vineyards produce 30,000,000 gallons of wine, and the orchards 4,500,000 gallons of cider. Among the productions are corn, beet, potatoes, hemp, and fodder, and bee-keeping forms a profitable occupation. The chief industries are shipbuilding at Nantes, iron-, sugar-, and glass-working, the canning of fruit and sardines, and there is much fishing, and export trade. St. Nazaire is the port, Nantes the capital.

Loiret, a department of Central France, part of old Orleanais and Berri. It is on the Loire, has 4 arrondissements, and contains 2,600 square miles, being for the most part a fertile upland plain,

producing corn and wine. The southern part is sandy, and belongs to the district called Sologne, which is now being drained and planted with pine. There are large forests, and the chief pursuits are the keeping of cattle, sheep, and bees. Other industries are the manufacture of pottery, porcelain, sugar, vinegar, and soap. Orleans is the capital.

Loir et Cher, a department of west central France, part of old Orleannais, has 3 arrondissements, and contains 2,450 square miles. It is mostly a plain, traversed in the S.W. for 37 miles by the Loire, and in the N.W. by the Loir for 56 miles, and the Cher for 50 miles, the latter rivers flowing through pleasant valleys. The productions are corn, fruit, wine, beet, timber, and the people occupy themselves in fishing, and keeping bees and poultry. Building-stone and pottery-clay are found, and the department formerly exported quantities of gun-flints. Cloth-working, glove-making, tanning, and glass-, paper-, and pottery-making are the chief industries. The capital is Blois.

Loki, a god of the Scandinavian mythology, in which he plays a part somewhat analogous to that of Mercury in classical mythology. He was older than the Æsir, on whom he played many tricks, and was handsome, wise, and crafty, and the cause of much strife. Among his deeds was the bringing about of the death of Balder.

Lollards, the name given to the English followers of John Wyclif (q.v.), is probably derived from the Low German verb *lollen* or *lullen*, "to sing," and may have been applied to the heretics in consequence of a supposed fondness for psalm-singing. It was used in Holland in the early part of the 14th century, before it found its way to England. Wyclif's views were eagerly accepted by many of the nobility; they also found some favour with the mercantile class, but it was in the University of Oxford that they fell on the most congenial soil, and here Wyclif gained many disciples, the most eminent being Nicholas Herford, who assisted him in his translation of the Bible. The religious revival was not, however, confined to the upper and middle ranks of society, for the itinerant preachers instituted by Wyclif under the title of "poor priests" carried his doctrines through the length and breadth of the land. In the minds of the ignorant masses the yearning for spiritual freedom became confused with vague notions of social and political equality, and was certainly one of the causes which led to the Peasants' Revolt in 1381. Mainly in consequence of that rising John of Gaunt and other powerful supporters of Wyclif withdrew their protection from him. In the same year the first Act against the Lollards was passed, and in 1382 the movement was suppressed in Oxford. Nevertheless, Lollardism continued to thrive during the ten years which followed Wyclif's death. The petition presented to Parliament by the Lollards in 1395 shows how closely their views were modelled on his teaching. Among other points they object to the doctrine of transubstantiation, clerical celibacy, auricular confession, and prayers for the dead, denounce Mass as impious, and demand that the Church should be deprived of its temporal possessions and placed in

subjection to the king. The accession of the House of Lancaster was fatal to Lollardism. The success of Henry IV. was in great measure due to the support of the Church, headed by Archbishop Arundel, a bitter foe of the Lollards. Moreover, the kings of this line, especially Henry V. and Henry VI., seem to have been personally attached to the doctrine and ritual of the Church. The statute *De Heretico Comburendo* was passed in 1401 [HERESY], and although only two persons—William Sawtre and John Badby—were put to death under it during the reign of Henry IV., a projected rising in 1414 and the dangerous influence exercised by Sir John Oldcastle (q.v.), who was captured and executed in 1417, gave rise to more severe measures. After this little is heard of the Lollards, but they appear to have lingered on till the time of the Reformation, and probably contributed in some degree to its rapid progress in England.

Lolo, collective Chinese name of a large group of semi-independent hill tribes in the highlands of west and south-west China. They are numerous, especially in Yunnan, Kwei-cheu, and within the great bend formed by the Kinsha-Kiang river between Sechuen and Yunnan. The word has no meaning in Chinese, unless it be a reduplicate form like *bar-bar* to denote "stammerers," i.e. people speaking an unintelligible language. Those recognising the Chinese authorities are called *Pè* ("White"), or *Shuh* ("Baked"), while the independent wild tribes are *He* ("Black"), or *Sen* ("Raw"). The latter are regarded as true aborigines, quite distinct in type from all the surrounding Mongolic populations, taller than most Europeans, well-built, muscular, deep-chested, with arched but rather broad nose, rather prominent cheek-bones, and very fair complexion, described by some observers as "white." Those visited by Mr. Colborne Baber seemed to recognise him as one of their own race, and there are other reasons for supposing that these Lolos are not of Mongolic, but of Caucasian stock, akin to the Cambojans and other Caucasian peoples of Indo-China. Some have developed a certain degree of culture, and possess a curious writing system, of which several MSS. have reached Europe, some beautifully written on silk. This script has been identified with that of the Harapa stone seal, the prototype of numerous Asiatic alphabets, such as the Corean, Hifumi of Japan, Lampung, Batta, and Rejang of Sumatra, Mangkassar of Celebes, as well as the Indo-Pali itself. In other respects the Lolo, who call themselves *Tukia* ("Aborigines") or *Chinsi* ("Parents"), are little removed from the savage state, eating rats, birds of prey, and even carrion, cooked in a large pot, from which all help themselves with their hands. Much care is bestowed on the hair, which is gathered in front like a chignon or a horn, 8 inches long, and wrapped in a strip of black cotton. (E. C. Baber, *Travels, etc., in Western China*, 1882.)

Lombard, PETER (circa 1100–60), a mediæval schoolman, born near Novara and educated at Bologna. He went to France under the patronage

of Bernard of Clairvaux, and was appointed professor of theology at Paris, becoming in 1159 Bishop of Paris. He was called "Magister Sententiarum" from his chief work, a collection of opinions from the Fathers on points of doctrine, which was long a text-book in schools of theology.

Lombards. [LOMBARDY.]

Lombardy, an Italian province, forming a plain between the Alps and the Po, having Venice on the E. and Piedmont on the W. It belongs to the Po basin, is alluvial in nature, and is traversed by many streams and canals. Conquered by Rome in 222, it formed the province of "Gallia Cisalpina," it belonged in later times to a succession of powers till it fell into the hands of the Lombards, and was finally re-taken into the empire by Charlemagne. Still later it was divided into duchies, and city-republics, which grew rich and were the homes of freedom. Internal quarrels, however, brought about their downfall. It then for a time belonged to the Dukes of Milan, but at the death of the last duke in 1447 it became a bone of contention between France and the Emperor, falling eventually to the latter. From Charles V. it passed to Spain, which held it till 1713. It then became Austrian, and, though diverted by Napoleon, was restored to Austria in 1815, remaining in that country's possession until made part, in 1859, of the new kingdom of Italy. It is now divided into 8 provinces.

Lomond, LOCH, a long, irregularly-shaped lake in the counties of Dumbarton and Stirling, Scotland, having a length of 22 miles, and a width varying from a few feet in the N. to 5 miles in the southern part, and a depth varying to an extreme of 630 feet, and containing 27 square miles. It receives several streams, and its southern extremity communicates with the Clyde by the Leven. The wider part contains many picturesque wooded islands, and the loch is surrounded by heights, Ben Lomond, on the eastern shore, rising to a height of 3,192 feet. The waters abound in pike, perch, and trout.

Lomwe, a people of east Africa S. of the river Luli, between Mozambique and Lake Shirwa, are quite distinct from the Mozambique Makuas, with whom they were long confounded owing to fusions that have taken place between the two nations along the borderlands. The heart of their territory is occupied by the Namuli uplands, one of the most romantic and healthy districts in the whole of Africa. They were first visited (1879-83) by Consul H. O'Neil, who found them, despite their evil repute, to be a peaceful, industrious people, skilled in cotton-weaving and excellent workers in iron, altogether superior in most respects to their Makua neighbours. (H. O'Neil, *Journey from Mozambique to Lakes Shirwa and Amaramba*, in *Proceedings of the Royal Geographical Society*, November, 1884.)

London. 1. The capital of England and of the United Kingdom, on the bank of the river Thames, now reaches from Stratford in the east to Kew Bridge in the west, and from Highgate Hill on the north to Dulwich in the south. This is a stretch

of upwards of ten miles from east to west and about eight miles from north to south. The name properly belongs only to the City; but gradually it has been applied to the whole town, and the various boroughs which were of distinct origin have been included within its boundaries. By the Local Government Act of 1888 the Metropolitan area, which had been defined by the Act of 1855, forming the Metropolitan Board of Works, was constituted a county of itself. This area includes 74,672 statute acres. The Police district, which includes the outskirts and may be described as "Greater London," consists of an area of 441,587 acres.

London for many years did not extend beyond Middlesex and Surrey, but now the town has encroached upon the counties of Essex and Kent.

Calculations have been made of the population of London at various periods before the official censuses were taken, and in 1631 the Lord Mayor reported to the Privy Council that the number of mouths in the City of London and the liberties was 130,268. The figures of the population of London for some of the decennial periods in the present century are as follows:—1801, 864,035; 1821, 1,227,590; 1841, 1,872,365; 1851, 2,362,236; 1861, 2,803,989; 1871, 3,254,260; 1881, 3,815,544; 1891, 4,211,743. Previous to the Reform Act of 1885 London returned 23 members to Parliament for the following boroughs:—City 4, Westminster 2, Marylebone 2, Finsbury 2, Tower Hamlets 2, Hackney 2, Southwark 2, Greenwich 2, Lambeth 2, Chelsea 2, London University 1. By the Act of 1885 the number was more than doubled. The representation of the City was reduced from four to two, but the remaining seats are supplied by single-member constituencies, and the list of these in alphabetical order is as follows:—Battersea 1, Bethnal Green (North-East 1, South-West 1), Camberwell (North 1, Peckham 1, Dulwich 1), Chelsea 1, Clapham 1, Deptford 1, Finsbury (East 1, Central 1, Holborn 1), Fulham 1, Greenwich 1, Hackney (North 1, Central 1, South 1), Hammersmith 1, Hampstead 1, Islington (North 1, West 1, East 1, South 1), Lambeth (North 1, Kennington 1, Brixton 1, Norwood 1), London University 1, Marylebone (North 1, South 1), St. George's, Hanover Square 1, St. Pancras (North 1, East 1, West 1, South 1), Shoreditch and Hoxton 1, Haggerston 1, Southwark (West 1, Rotherhithe 1, Bermondsey 1), Strand 1, Tower Hamlets (Whitechapel 1, St. George's 1, Limehouse 1, Mile End 1, Stepney 1, Bow and Bromley 1, Poplar 1), West Ham (North 1, South 1), Westminster 1, Woolwich 1.

The government of London has undergone many changes of late years. The City has held from the first a specially privileged position. For a time the growth beyond the City walls was included in the government, under the style of Liberties, but the growth of the town was so great that in time by far the larger portion of the so-called London was outside the jurisdiction of the Lord Mayor and Corporation. By the Local Government Act of 1888 the portions outside the City were placed under the government of the London County Council, which superseded the Metropolitan Board of Works, the curious result being that the large district

including the boroughs round the City which were never legally entitled to be styled London were constituted a county with that title.

London is of great antiquity, and was originally a clearing out of a vast forest, remains of which still existed in the reign of Elizabeth, and the recollection of which is kept alive in the name of St. John's Wood. Bones of the mammoth have been dug up in the neighbourhood of Euston Square, and traces of a manufactory of flint instruments have been discovered at Stoke Newington. Pile buildings have been found near London Wall to the north and in Southwark Street to the south of the river. Several watercourses ran from the northern heights to the Thames, but traces of these must now be sought in the sewers.

The very existence of a British London has been denied by Dr. Guest and others, but the evidence seems to be decidedly in favour of the view that London was a commercial town in British times. Two points in favour of this view may be mentioned here: (1) the origin of the name itself is undoubtedly British, and (2) when we first read of Roman London in Tacitus it is described by the historian as the mart of trade so early as A.D. 61. If the town was founded by the Romans there was little time by that year for it to have grown into a place of commercial importance. British London, however, must have extended over a very small area, and we have reason to believe that the earliest Roman London did not extend westward of Leadenhall. No funeral relics have been found between Gracechurch Street and the Tower; but cemeteries once existed in Cheapside, on the site of St. Paul's Cathedral, and close to Newgate, as well as in various places known to have been included in the later Roman London, which probably extended over the area for many centuries afterwards included within the London walls.

We thus know that the town was constantly increasing and growing in importance, but few or no incidents are recorded save that the title Augusta was added to the name Londinium in the latter years of the Roman occupation.

For some years after the Saxon invasion the history of London is a blank. Dr. Guest supposed that the town remained for a period desolate and uninhabited owing to the repugnance of the Saxons to walled cities. This, however, is very improbable, and we have no record of the driving out of the Romanised British who inhabited London. It is easier to believe that the Saxons in time got over their repugnance and gradually assimilated themselves with those who carried on the trade of the place. Bede describes London as being in A.D. 604 the metropolis of the East Saxons and an emporium of many peoples. Danes and Saxons were constantly fighting for the possession of London until, in the year 886, King Alfred was allowed undisputed possession and rebuilt its walls. The defeated chiefs after the battle of Hastings retired upon London, and William the Conqueror followed them, although he did not lay siege to the city. "The best men of London," seeing the hopelessness of their cause, repaired to Berkhamstead, where they submitted themselves and swore fealty to the

conqueror. The citizens were benefited by their submission, and in the second year of his reign King William granted them a charter, which still exists. One of the king's first works was the building of the Tower to overawe the Londoners.

Almost immediately after the conquest the building taste of the Norman exhibited itself; St. Paul's Cathedral was rebuilt, and many new ecclesiastical foundations came into being. The number of monasteries built in the reign of Henry I. was so great that almost all the labourers of the country are said to have become bricklayers and carpenters. The distinctive feature of Plantagenet London was the coming of the friars in the thirteenth century, and it is not easy to understand how room could be found within the City walls for the extensive buildings of the Black, the White and the Grey Friars.

During the Tudor period the monasteries which had taken such firm root in the land were suppressed, and many troubles followed therefrom. One effect was to leave large portions of the city almost in ruins. Gradually this evil was overcome, and hospitals took the place of monasteries and friaries. How wild the surrounding country was may be guessed from a proclamation of Henry VIII., the object of which was "to preserve the partridges, pheasants, and herons from his palace at Westminster to St. Giles's in the Fields, from thence to Islington, Hampstead, and Hornsey Park." The settled character of Elizabeth's reign caused a change in this respect. Suburbs extended on all sides, and citizens built themselves residences in Middlesex, Essex, and Surrey. But Elizabeth found it necessary to issue a proclamation in 1580 forbidding any one to build upon ground which had never been built upon before within the memory of man; the extension of London being deemed to be full of evil, as spreading the plague, causing a scarcity of victuals, etc.

London did not change very much during the early Stuart period, although great fears were felt on account of its rapid growth. In 1630 Charles I. issued a proclamation in which "the erection of any building upon a new foundation, within a limit of three miles from any of the gates of the City of London or palace of Westminster," was forbidden. Country magnates were not allowed to remain in London without special permission, and in 1632 Mr. Palmer, a large landholder in Sussex, was fined by the Star Chamber £1,000 for living in London longer than the period prescribed in the proclamation of June 20th of that year.

At the Restoration a great change took place in the growth of the town. The Royalists who returned to their native country did not care to take up their residence in the old family mansions in the City, but founded new ones in Covent Garden, Spring Gardens, and St. James's. The West-End greatly increased in size, and, with few exceptions, the inhabitants of the City were confined to those who made their money there. This westward exodus was greatly helped forward by the Fire of London in 1666, when a total clearance was caused equal to an oblong square of a mile and half in length and half mile in breadth. In the fire eighty-five out of ninety-eight parish churches within the

walls were burnt down. The way in which this terrible calamity was met does the greatest credit to the manliness of the Londoners. They did not stand still and bewail their sad condition, but set to work at once to repair the misfortune that had come upon them. The City was rapidly rebuilt, and, although we may regret that the architectural plans proposed by Wren, Evelyn, and others, were not carried out, we cannot but marvel at the excellent spirit evinced by all and the few disputes that occurred, owing to the regulations adopted and the wisdom of the judges who were appointed to carry these out.

In the 18th century there was a considerable extension of building operations in the West-End, and a district north of Oxford Street was commenced, but in the middle of the century a farm still existed behind the British Museum. Near the end of the century the villages of Hackney, Islington, Stepney, Hoxton, St. Pancras, Marylebone, Paddington, Knightsbridge, and Chelsea were all known as country outskirts of the town.

At the beginning of the 19th century grapes were ripened by the sun in the open air in Gower Street, and fine celery was grown in Upper Gower Street. Regent Street was planned in 1812, Belgravia was built about 1825, and New Oxford Street in 1847. With these exceptions, little alteration was made in London thoroughfares until after the holding of the Great Exhibition of 1851. Since then the City has been almost entirely rebuilt, new districts have been built upon, and the outlying villages have been united to London so as to form an immense and ever-increasing town.

London grew for many centuries along the side of the river, which formed a means of communication from point to point, and supplied the inhabitants with water. At the end of the 18th century the north of London began to be built upon, and the building over the clayey soil to the north of the New Road was largely connected with the increase in the number of the water companies. As an instance of the late growth in this connection, it may be mentioned that a gentleman now living remembers, as a boy, visiting at his uncle's country house in Hoxton. It was then the custom for the travellers to wait in Finsbury Square till a sufficient number of persons were collected, and then they were conducted across the dangerous ground between that place and Hoxton by the horse patrol. By this growth away from the river, and the building up of wharves, etc., by the river-side, London lost much of its natural beauty, and the Thames did not recover its proper position as the central feature of the town until the building of the noble embankments, the total cost of which was over £3,000,000. The Victoria Embankment on the north side of the river (from Westminster to Blackfriars Bridge) was constructed 1864-70, the Albert Embankment (from Westminster Bridge to Vauxhall) on the south side, 1865-68, and Chelsea Embankment, 1871-74.

Water Supply. During the early centuries of its history London was supplied with water from numerous wells, some of which have left their mark in the names of places, from the Thames, and from

many streams that fell into the river; but in the 13th, 14th, and 15th centuries water was brought into the City by pipes to several large conduits, and from these the inhabitants were supplied by water-carriers. As early as the 13th century the exhalations from the Fleet river had become offensive, and in 1307 the river was inaccessible to ships on account of the accumulation of filth.

In 1522 Peter Morris obtained a grant to enable him to supply Thames water to houses at the east end of the City, and for this purpose he erected a "forcier" on an arch of London Bridge. The works were afterwards greatly enlarged, and in 1701 were sold to a company which continued the supply until 1822, when the Southwark Company purchased their rights. The New River Company commenced operations early in the 17th century, and by 1720 London was so well supplied that Strype wrote at that date:—"There is not a street in London but water runs through it in pipes conveyed underground, and from these pipes there is scarce a house whose rent is £15 or £20 per annum but has the convenience of water brought into it." Smaller houses were supplied from a cock or pump situated in the street near by. The dates of the formation of the water companies which subsequently came into existence are as follows:—Chelsea 1721, Lambeth 1783, Vauxhall 1805, West Middlesex 1806, East London 1806, Kent 1810, Grand Junction 1811, and Southwark 1822. The need of a further supply has been long felt, and many proposals have been made, but nothing has been done to settle the matter, although several reports of royal commissions have been published.

Sanitation. Very little knowledge of sanitary needs was general until late years, and old London before the fire must have been a peculiarly unhealthy place. In spite of the unsanitary condition of the City, London has usually been in advance of other places in the adoption of remedial measures. In 1531 an Act of Parliament was passed providing for the appointment of a Commission of Sewers, and this was renewed in 1548, and extended in its application by James I. in 1607; but until 1848 the discharge of house sewage into the main drainage was forbidden, and the construction of cesspools was enforced. In that year the Metropolitan Commission of Sewers was created by Act of Parliament. Complaints of the condition of the Thames by reason of the emptying into it of the sewage of a great city became so general that the Metropolitan Local Management Act was passed in 1855 to provide for the creation of the Metropolitan Board of Works, which was entrusted with the construction of works for the discharge of the sewage at such a distance from London as would prevent the pollution of the river. The main drainage scheme was carried out between 1859 and 1863 at a cost of £4,607,000. Since that time great attention has been paid to the sanitary condition of the houses, and great improvements have been made.

Lighting. Until nearly the middle of the 18th century the duty of illuminating the streets on dark nights was left entirely to the citizens themselves,

with the result that those who went out at night were forced to provide themselves with lanterns. In 1736 the Corporation obtained permission from Parliament to levy a rate for the purpose of erecting oil lamps. Winsor's patent gas was exhibited in June, 1807, in Pall Mall, but Finsbury Square was the first public place in London in which gas-lighting was actually adopted, and Grosvenor Square the last. Several gas companies were formed, but it was many years before oil lamps were entirely superseded. Great improvements have been made in gas lamps, but the electric light is now coming largely into use for street lighting and in the illumination of large buildings. St. Pancras was the first parish to generally adopt the electric light.

From the earliest times London has been a commercial city; and owing to its commanding position it is likely to hold the commerce of the world for many years to come.

Docks. There were formerly various wharves and quays in the port of London, which were set aside for the accommodation of merchants of all nations and as landing-places for their goods and merchandise; but as the city grew these were found to be quite inadequate to the wants required of them, and at the beginning of the present century several dock companies were formed. West India Docks at the Isle of Dogs were opened in 1802, London Docks at Wapping in 1805, East India docks at Blackwall in 1806, St. Katherine's docks, on the site of St. Katherine's Hospital, at the east end of the city in 1828, Victoria docks in 1850, and Millwall docks at the Isle of Dogs in 1868. The Albert extension of the Victoria docks was opened in 1880, and the latest of these great reservoirs prepared for large vessels is the Tilbury dock. All these are on the north side of the river. The Commercial docks, reconstructed 1807, and the Surrey docks (1812) are on the south side.

Bridges. It is not known when the first bridge was built, but there is every reason to believe that one existed in Roman times. Until 1769, when Blackfriars Bridge was built, London Bridge was the only one over the Thames connecting the north and south of London. Most of the older bridges have been rebuilt—London Bridge in 1831, Blackfriars Bridge in 1869, Westminster Bridge in 1854–62; Waterloo Bridge built 1811–17, and Southwark Bridge in 1815–19, still remain. Several new bridges have been built farther up the river, and others have been rebuilt. The Tower Bridge, so constructed as to allow of large vessels passing under it, is the most important addition to the bridges of London of late years; and, after having been in progress for a considerable period, it was completed in 1893.

Markets. Markets were originally held in the open streets, and such names as Cheapside, East Cheap, Poultry, and Bread Street, point to the places where early markets were held. Leadenhall, Billingsgate, and Smithfield markets are of considerable antiquity; the first two still exist, but the last has been abolished on account of the crying evils connected with its management. It has been superseded by the Central London Meat Market,

which was opened in Smithfield in 1868. Several other markets have been added to this by the Corporation. In the western portion of the town Hungerford market, founded in 1680, came to an end in 1860, and its site is now occupied by Charing Cross station. Covent Garden market for vegetables, fruit, and flowers, still holds its own; and the ill success of Columbia Market, founded by the Baroness Burdett-Coutts, shows how difficult it is to establish a new centre of trade. Farringdon Market, which superseded the old Fleet Market and was the successor of Stocks Market, once situated where the Mansion House now stands, has been sold and pulled down.

Architecture. The streets of London contain some good specimens of architecture; but, owing to the want of local regulations the effect of a fine building is often spoilt by its surroundings. This is specially the case with respect to the view from Charing Cross bridge over the Victoria Embankment, with the beautiful dome of St Paul's in the distance. The Examination Hall of the Colleges of Physicians and Surgeons was built by the side of Waterloo Bridge, and the elevation was unnecessarily low, so that when the Savoy Hotel was built it was completely dwarfed. Then the large building on the Salisbury estate dwarfed the Savoy Hotel and all the buildings near, completely spoiling the general effect of the view. Very handsome buildings have been erected in parts of the City, but in several instances these are too high for the width of the streets in which they are situated. The finest street in the West-End is Pall Mall, which consists, to a great extent, of a series of palaces for the chief clubs.

The Houses of Parliament (1840–1867), which cost about £3,000,000, form the grandest pile of secular buildings in London. Of modern London buildings, the second in importance is that designed by the late G. E. Street, R.A.—the New Law Courts. The royal palaces cannot be praised for architectural effect. Buckingham Palace is beneath contempt, and St. James's Palace, although interesting from its associations, is mean in appearance. Wren's noble cathedral, which replaced the old cathedral of St. Paul's, forms the finest object in most views of London. Many of the churches of the City designed by Wren add a special feature of interest to the view on account of the beauty of the steeples; but unfortunately many have been ruthlessly destroyed, and others are threatened with destruction.

St. Thomas's Hospital on the Albert Embankment has a very distinguished position, and balances the Houses of Parliament on the other side of the river, but it is not deserving of much praise as a beautiful building.

Great sums of money have been spent upon the Government offices in Whitehall, but on the whole, Somerset House, in the Strand, may be considered as the most satisfactory public building in London, although the Bank of England and the Royal Exchange have special merits.

Relics. In a city of such great antiquity as London one might expect a large number of relics of the past, but the Great Fire of 1666 destroyed much, and during the last fifty years more still has

passed away. The relic of the greatest antiquity is the London Stone, now fixed on the front of St. Swithin's church, Cannon Street. It has been generally supposed to be a Roman *milliarium*, but some have claimed for it a still greater antiquity, and it has always been treated with superstitious reverence as having been connected with the history of the City. The history of the Tower takes us back to the time of the Norman conquest, and of churches of special interest may be mentioned Westminster Abbey, one of the grandest ecclesiastical buildings in the country. St. Bartholomew's, St. Helen's, Bishopsgate, St. Olave's, Hart Street, and the Temple church are all of great interest, and Lambeth Palace must not be forgotten in any list of the relics of the past.

Hospitals. St. Bartholomew's, St. Thomas's, and Guy's Hospitals are establishments of great interest and importance, and hospitals of a later date are to be found in all parts of the town. The existence of these noble institutions for the treatment of disease is a cause of pardonable pride to all Londoners.

Colleges and Schools. If the grand bequest of Sir Thomas Gresham had been wisely administered, London might have been a university town some centuries ago. The University of London, which is not a teaching university but only an examining body, was instituted in 1836, and removed in 1869 to its present building in Burlington Gardens. University College, Gower Street, was founded in 1828, and it has been greatly enlarged within the last few years. King's College, Strand, was built in the same year. St. Paul's School occupied a prominent position in St. Paul's Churchyard from its establishment by Dean Colet in 1512 until it was removed to West Kensington. The position occupied by the school has been taken by certain places of business, which ill replace it. St. Peter's College, Westminster, is quartered in the dormitory of the old monks of Westminster Abbey. Christ's Hospital (Blue Coat School), Newgate Street, is to be removed to the country. Charterhouse School has been removed to Godalming. Merchant Taylor's School, which was situated in Suffolk Lane, was removed to the Charterhouse in 1875. The City of London School, first situated in Milk Street, Cheapside, was removed to a handsome building on the Victoria Embankment in 1883.

Museums and Picture Galleries. The British Museum, which originated in the purchase by Parliament in 1753 of the collections of Sir Hans Sloane, and has been enormously added to since then, is now one of the most remarkable collections to be found in Europe, and the library is widely renowned. The Natural History collections have been removed to a new and handsome building in Cromwell Road, South Kensington. The South Kensington Museum was originated by Sir Henry Cole, who carried out the wishes of the late Prince Consort, and it has become a unique repository of artistic treasures.

The National Gallery, founded in 1824, has grown into one of the first of European collections of pictures, and these pictures are well housed in handsome galleries, although the exterior of the

building is far from prepossessing. A building attached to the National Gallery and fronting Charing Cross Road is now in course of erection for the National Portrait Gallery.

Parks and Open Spaces. London has been peculiarly fortunate in its parks, and these have been added to with commendable foresight. The necessity for open spaces to mitigate the evils of such a mass of houses has been generally acknowledged. St. James's Park (80 acres) was formed by Henry VIII., and improved by Charles II. Green Park (70 acres) forms a part of St. James's although separated from it by iron railings. Hyde Park (390 acres) existed for many years as a portion of the Manor of Hyde, and it became the most fashionable resort after the Restoration. Kensington Gardens (360 acres), formerly attached to the Palace, now forms part of Hyde Park. Regent's Park (470 acres) was formed out of Marylebone Park, and was named after George IV. when regent. The parks which have been formed in the present century are:—Victoria Park (300 acres), 1842, enlarged in 1872, Battersea Park (180 acres), 1852–58, Finsbury Park (115 acres), and Southwark Park (63 acres), which is not in Southwark but at Rotherhithe. Hampstead Heath and various commons may be added to this notice of open spaces. Few cities can boast of such beautiful environs and outskirts as are common on all sides of London.

Conveyances. The Thames afforded for many centuries almost the only means of communication between different parts of London, but early in the seventeenth century hackney coaches were introduced in the streets. Omnibuses were brought out in 1829, but they did not become common until many years after this date. Tramcars have been introduced into London with success, but, owing to the narrowness of many of the streets, their operations have been necessarily circumscribed. They are not so general in the north of London as in many Continental cities, but there are a larger number in south London.

2. A city and port of Ontario, Canada, midway between Lakes Erie and Huron, at the junction of the two branches of the Thames, 116 miles S.W. of Toronto, the capital of Middlesex. It is well built, with regular streets and fine public buildings, and the inhabitants have, in the names of the streets and bridges, assimilated it as closely as possible to its namesake in the old country. It is a great railway centre, and being in a rich district enjoys a prosperous trade. The chief industry is the refining of petroleum. There are also foundries, mills, tanneries, and factories of different kinds. In the neighbourhood are sulphur springs. The town returns one member to Parliament, and one member to the Provincial Legislature.

London, UNIVERSITY OF. The idea of a London University is much older than any institution bearing the name. Professorships of divinity, music, rhetoric, astronomy, geometry, law, and physic, for the benefit of residents in London, were established by Sir Thomas Gresham in 1548; but no further steps were taken in this direction till

1827, when, through the efforts of the poet Campbell and others, the society now called University College came into existence, and sufficient capital was subscribed to erect the existing buildings in Gower Street. It was founded on a non-sectarian basis, and, though merely a teaching body, looked forward to a charter of incorporation, which should give it the power of conferring degrees; it therefore styled itself the "London University." The failure of a Bill for admitting Dissenters to the old universities added force to this demand; but, whilst incorporating University College, in 1835, the Government thought it more prudent to institute a separate body for the purpose of examining for degrees (1836). University College and King's College (incorporated 1829) were at once affiliated to the new foundation, which was governed by a Senate comprising a Chancellor, Vice-Chancellor, and thirty-six fellows. Other colleges were affiliated in 1850, and candidates for degrees were required to show that they had received instruction at one of these during two years; but, as the Senate had no control over the affiliated colleges, the system was found unsatisfactory. It was abolished by the charter of 1858; but for medical degrees attendance and clinical practice at a recognised medical school remained a necessary qualification. At the same time the graduates were constituted members of the governing body under the title "Convocation." Since the formation of the Parliamentary constituency in 1867 Convocation has been the electoral body; it also has the power of accepting or rejecting new charters, of nominating three persons for one fellowship in every four, one of whom is selected by the Crown, and of discussing all matters concerning the university. The present charter, granted in 1863, is almost identical with that of 1858. The university was not attached to any one spot prior to 1870, when the building in Burlington Gardens was erected. In 1867 special examinations were instituted for women, but in 1878 they were placed in all respects on a perfectly equal footing with men. Degrees are now conferred in Arts, Science, Laws, Music, and Medicine; the medical degrees include Bachelor and Doctor, both of Medicine and Surgery. Since 1859 the study of English Philology and Literature has formed a special feature of the Arts course. The Science faculty was instituted in 1860, and the faculty of Music in 1877. The university course extends over two years, and embraces three examinations, that for degrees being preceded by the examination for matriculation, which must be passed by all candidates before they can proceed further; and the intermediate examination, designed to take the place of the certificates previously granted by the affiliated colleges. Different papers are set in the intermediate examination, and that for the Bachelor's degree, according as to whether the candidate seeks or does not seek honours. The various by-laws and rules regarding the examination are enacted by the Senate, but they must receive the sanction of the Home Secretary. The university is still to some extent supported by the Government; but the fees now cover the greater

part of the expenses. The examiners are selected annually by the Senate from those who present themselves as applicants. Examinations may be held at any provincial centre, whether city, institution, or college, which expresses a desire to that effect. These examinations are conducted by the Senate, and take place simultaneously with those in London. Examinations are also held in the Colonies. Great efforts are now being made to establish a teaching university for the whole of London, and the question is now (1893) under consideration by a Royal Commission.

London Clay, the chief member of the Lower Eocene (q.v.), is a great marine clay, blue where not in contact with air, but turned to brown for some distance from the surface. It contains layers of septarian nodules, which are collected at Harwich and Sheppey for the manufacture of Roman cement. The clay is about 500 feet thick in the London Basin, and extends from Hungerford (Berks) to Suffolk and the Isle of Thanet, covering most of Hertfordshire, Middlesex, and Essex. In the Hampshire Basin the thinner Bognor clay, and in France the Argile de Dunkerque, are of the same age. The London Clay seems to have been deposited in a bay with a tropical climate, and water about 100 fathoms deep. Numerous fossil fruits, including those of *Nipadites*, allied to *Nipa*, a palm whose fruits now float down the Ganges, custard-apples, acacias, and Proteaceæ, have been found in this clay at Sheppey, together with crabs such as *Xanthopsis*; many gastropods, including large cowries (*Cypræa*), cones, volutes, *Fusus* and *Pleurotoma*; *Belosepia* and six species of *Nautilus* among cephalopods; *Cryptodon* (*Ævinus*) *angulatum*, and other bivalves; rays such as *Myliobates*, sharks, a sword-fish 8 feet long, and a saw-fish 10 feet long; crocodiles, numerous turtles, and sea-snakes (*Palæophis*), the earliest known ophidians; birds, including the notched-billed *Odontopteryx*; and an opossum and the pachyderms *Coryphodon* and *Hyracotherium*. These fossils suggest a comparison between the London area in Lower Eocene time and the shores of the Bay and Sea of Bengal at the present day.

Londonderry. 1. A maritime county of North Ireland, in the province of Ulster, on the North Atlantic, having Antrim on the E., Donegal on the W., Tyrone and Lough Neagh on the S. and S.W. It is 50 miles long by 40 wide, and contains 816 square miles, and has a coast-line of 30 miles, in parts lofty and rugged, in others low. The surface consists of river valleys, separated by tablelands, and rises in the S. to a height of 2,000 feet. Among the rivers are the Bann from Lough Neagh, which divides Londonderry from Antrim on the E., the Foyle in the W., and the Roe. About 37 per cent. of the surface is grass, and the chief productions of the arable portion are oats, potatoes, turnips, and flax. Linen is the staple manufacture, the fisheries are valuable, and iron is found in the bogs, and was formerly worked. Lead and copper also are found. Belonging originally to the O'Neils, the district was in the 17th century made over chiefly to London Companies,

and managed by the Irish Society. The county returns two members to Parliament. The chief towns are Londonderry, Coleraine, and Limavady.

2. Londonderry, the capital of the county of the same name, is on a height, situated 3 miles from the mouth of the Foyle, 162 miles N.W. of Dublin, and 95 miles N.W. of Belfast. The town, which in great measure belongs to the London Companies, has a good harbour, and forms a place of call to some of the American liners, and has a good import, export, and coasting trade. The chief industries are the manufacture of shirts and under-clothing, ship-building, distilling, and iron-founding. There is good salmon-fishing on the Foyle and in the lough. The city—the greater part of which is now outside the ancient walls—has a central square with four main streets diverging, and an iron bridge of 1,200 feet leads to the suburb Waterside on the right bank of the Foyle. Among the chief buildings are the Protestant cathedral, the Roman Catholic cathedral, the courthouse, guildhall, harbour office, custom-house, and banks. Londonderry is noted for its siege in 1689, and a column commemorates the Rev. G. Walker, its defender.

Long, GEORGE (1800–79), an English classical scholar, was born at Poulton, Lancashire, and educated at Trinity College, Cambridge, where, in 1821, he was bracketed with Macaulay for the Craven, and in 1822 was wrangler and senior medallist, becoming fellow of his college in 1823. In 1824 he filled a post in Virginia as lecturer in Ancient Languages, and in 1828 became professor of Greek in London University. From 1842–46 he was professor of Latin at University College, London, and from 1846–49 Reader in Law at the Temple. While in London he had much to do with advancing the Royal Geographical Society. From 1848–71 he was Classical Lecturer at Brighton College, where he was much esteemed. He edited the *Journal of Education*, *Penny Cyclopædia*, *Biographical Dictionary*, *Bibliotheca Classica* series, and contributed to other works, and issued versions and editions of classical authors. He also wrote *The Decline of the Roman Republic*, 5 vols.

Long-billed Birds of Paradise (*Epi-machinæ*), a sub-family of Paradisidæ, with four genera, characterised by their long, slender bills, and the plumage of the wings and tails highly developed.

Longchamp, WILLIAM DE, a 12th century Norman statesman, and favourite of Richard I., who made him Bishop of Ely, and joint justiciar of England. He hated the English, and was hated by them, and his arrogance and oppression caused him to be sent into retirement to Normandy. But he was active in procuring the ransom of Richard, who in gratitude made him Chancellor, but he was again overthrown by the influence of the Princes John and Geoffrey, and died in 1197.

Longevity. The duration of life in different animals varies between very wide limits. Some insects live in their perfect form for a few hours only; while the elephant, eagle, carp, and other creatures attain, in some instances, an age considerably

exceeding 100 years. For each species it appears that a limit of age, which is rarely exceeded, can be fixed: and when the individual member of the species lives for a longer period than that indicated it is said to present an instance of longevity. In man, the limit of the duration of life can be determined with some degree of exactness, at any rate so far as those countries are concerned in which an attempt to accurately register all deaths is made. English statistics show that considerably less than one-tenth of those born attain to the age of 80, while of 100,000 born less than 20 reach the age of 100. Careful inquiry has been made in recent years into the subject of centenarians, and it has been shown that those instances in which human life has been stated to considerably exceed the 100 year limit, are not well authenticated. A German man of science, Weismann, has recently discussed the question of the duration of life in its relation to the theory of Darwin. He maintains that the average length of life in each species is determined by the process of natural selection, and that the average duration of existence in the individual is largely determined by the length of time required by it to produce and rear its offspring to maturity.

Longfellow, HENRY WADSWORTH (1807–82), an American poet, whose name is a household word on both sides of the Atlantic. He was born at Portland, in Maine, and was educated at Bowdoin College, where he had Nathaniel Hawthorne for classmate. He distinguished himself in ancient and modern languages and translations, and in 1826 he went to France, Spain, Italy, and Germany with a view to a professorship of Foreign Languages and Literature. The fruits of this trip are embodied in *Outre Mer*, as were the fruits of a later one in *Hyperion*, two prose works which some people esteem almost as much as his poetry. In 1836 he was appointed professor of Modern Languages and Literature at Harvard. In 1839 appeared his first book of verse, entitled *Voices of the Night*, and from that time the productions of his pen flowed steadily forth. Among his longer works *Evangeline*, *The Building of the Ship*, *Hiawatha*, *The Golden Legend*, *The Spanish Student*, *The Courtship of Miles Standish*, and the *Tales of a Wayside Inn*, are widely read and admired; while of his short poems, *The Wreck of the "Hesperus,"* *The Village Blacksmith*, *The Slave's Dream*, *The Sands of Life*, *The Belfry of Bruges*, *The Children's Hour*, and many others are universal favourites. He was also singularly successful in his translations from the Norse and German.

Longford, an inland county of the province of Leinster, Ireland, to the east of Lough Ree and the upper Shannon, having a length of 29 miles, a width of 20 miles, and containing 421 square miles. The surface is generally level, with low hills, interspersed with bogs, and is fertile. About one-half is grass land, and the arable portion produces oats and potatoes. There are several small lakes, and the chief rivers are the Camlin and Tuny, while the Royal Canal also passes through. There is some marble-quarrying; but the chief industries

are the manufacture of linen and coarse woollens, and the making of butter. On the islands of Lough Ree are some interesting remains of monasteries. The county returns two members to Parliament. Longford, the county town, is 76 miles N.W. of Dublin.

Longicornia, the division of beetles including those in which the antennæ, or "horns," are long, simple, and rod-like in form. The best-known English species is the "Musk Beetle" (*Aromia moschata*), which has a strong musk-like odour.

Longinus, DIONYSIUS CASSIUS (c. 213–73), philosopher and rhetorician, studied under Ammonius at Alexandria, and taught at Athens. He settled at Palmyra, and became chief counsellor of Zenobia, whom he encouraged to resist Rome. He was consequently beheaded by Aurelian. His views were modelled upon Plato, and a work *On the Sublime* exists, with which he is commonly, though probably erroneously, credited.

Long Island, forming three counties of the state of New York, U.S.A., is bounded on the N. by Long Island Sound, on the S. and E. by the Atlantic, and on the W. by East River, crossed by Brooklyn Suspension Bridge. The island is 115 miles long, with a breadth varying from 12 to 24 miles, and contains 1,682 square miles. The interior rises in a line of low hills, and on the S. shore is a series of lagoons, while much of the surface is forest and waste. There are lakes and watercourses, and market-gardening is largely carried on. Game and fish are plentiful, and the oyster-beds are renowned. The famous Blue Points come from here. The chief towns are Brooklyn, Long Island City, and Flushing, and the island is well provided with railways. Other places of note are Coney Island—a celebrated watering-place—and the Creedmoor Rifle Range.

Longitude, in astronomy. [LATITUDE.]

Long Parliament, the name usually given to the Parliament which met on November 3, 1640. Its members were unanimous in their determination to rid the country from the "thorough" policy of Strafford and Laud, who were impeached—Strafford's impeachment being afterwards converted into an attainder—and put to death. An attempt to save Strafford by means of the army was followed by an Act by which it became impossible to dissolve the Parliament without its own consent. The Star Chamber and Court of High Commission were abolished, and an Act was passed making it illegal to raise taxes without consent of Parliament. In consequence of the ascendancy of the Presbyterian element the Parliament was "purged" by Colonel Pride, who surrounded the House with two regiments, and ejected ninety-six members (December 6 and 7, 1648). The members who were left, henceforward known as the "Rump," were expelled by Cromwell on April 20, 1653. They were recalled after the overthrow of Richard Cromwell (May, 1659), but were again expelled by Lambert in the following October. The Rump was restored a second time by Monk, who reinstated all the members previously excluded

(February 21, 1660). It was now determined to summon a new Parliament, and the Long Parliament dissolved itself on March 16, 1660.

Longsword, WILLIAM (1196–1226), the natural son of Henry II. by "Fair Rosamund;" he was made Earl of Salisbury, and distinguished himself in the Crusades. His son, WILLIAM (died 1250), was deprived of his earldom by Henry III., and was slain in the Crusades.

Loo (originally *lanterloo*, a word of Dutch origin), a round game of cards. Each player places in the pool a certain number of coins or counters (either three or some multiple of three), which are termed his "loo." The dealer, whose stake is double that of the others, deals three cards to each player and an additional hand called "miss." The card which remains at the top is turned up as trump, and the cards rank in all respects exactly as in whist. The player on the dealer's left then examines his cards and determines whether he will "declare," "withdraw," or "take miss." A player who declares and loses the trick is "looted"—i.e. he pays into the pool a fine equal in amount to the stake.

Loochow Islands are a group of thirty-seven isles, extending from Kynshu, in Japan, almost to Formosa; and containing 1,863 square miles. The chief islands of the group are Oshima and Okinawa, the former of which has a good harbour. China lays claim to the islands, though the inhabitants in general characteristics are of Japanese type, with some peculiar customs of their own. The products of the islands are sugar, sago palm, oranges, and a small breed of ponies, and the staple food of the natives, pork, fish, and sweet potatoes.

Lophobranchii. [BONY FISHES.]

Lophopsittacus, a name proposed for an extinct group of parrots, of which *L. mauritianus* may be taken as the type. They had a frontal crest rising from the base of the beak.

Lophopus, the "Bell Flower Animal," was first described more than a hundred and fifty years ago. It belongs to the Polyzoa, a class of small animals which usually live in large colonies, each individual protruding its crown of tentacles through a separate aperture, and withdrawing it instantly on the least alarm. The common "Sea-mat" (*Flustra*), usually taken for sea-weed, is the dried skeleton of a colony of Polyzoa.

Lord (Anglo-Saxon *hlaford*, "guardian of the loaf," i.e. "master of the house," a word probably of poetical origin) is a title now strictly applicable only to peers of the realm (including the Lords spiritual, or archbishops and bishops who have seats in the House of Lords) and to the holders of certain public offices, such as the Lord Chancellor, Lord-Lieutenant of Ireland, etc. It is also prefixed to the courtesy titles of the eldest sons of dukes, marquises, and earls, and to the Christian name and surname of the younger sons of dukes and marquises.

Lord High Admiral, the highest combined administrative and judicial officer in the British

Navy. His duties have occasionally, and now for more than half a century, been divided among the Commissioners of the Board of Admiralty, but there is nothing to prevent a Lord High Admiral being again appointed. The Duke of Clarence, afterwards William IV. (1827-28), was the last Lord High Admiral.

Lord-Lieutenant. A Lord-Lieutenant in England is an officer of great distinction appointed by the Crown for managing the standing militia of the county and all military matters therein. The office is supposed to have originated in the reign of Henry VIII., for Lord-Lieutenants are mentioned as known officers, though they had not been long in use. Camden speaks of them in the time of Queen Elizabeth as extraordinary magistrates, constituted only in times of difficulty and danger. They are generally of the chief nobility and of the best and most esteemed interest in the county, and they are to form the militia in case of a rebellion, etc., and march at the head of them as the Crown shall direct. They have the power of presenting to the sovereign the names of deputy-lieutenants, who are to be selected from the best gentry in the county, and act in the absence of the Lord-Lieutenant. Their jurisdiction and privileges in relation to the militia, yeomanry, and volunteers reverted to Her Majesty by statute 34 and 35 Vict., c. 86. Subservient to the Lord-Lieutenant and the deputy-lieutenants are the justices of the peace. The appointment of county magistrates has been usually made by the Lord Chancellor on the recommendation of the Lord-Lieutenants. This practice has lately been the subject of discussion in Parliament, and objection having been taken to this almost invariable practice it is quite likely that some modification in such appointments will ere long take place. The Lord-Lieutenant of Ireland is the representative of the Queen in that country, and is invested with special rights and privileges in that capacity.

Lord of the Isles, a title borne by certain chieftains in years gone by of the Western Isles of Scotland. The title—though not assumed till later—seems to have had its origin in the gift of Arran and Bute by David I., in 1135, to the Lord of Argyll. He was killed by Malcolm IV., in 1164, and his sons held the southern isles, nominally under the Scottish Crown. It was John, son of Angus of Isla, who first assumed the title. After intrigues and reverses of various kinds the line came to an end in the person of John, fourth and last lord, who was deprived by James IV., in 1493, and in 1540 the title was annexed to the Crown of Scotland.

Lord's Supper, the name given in the Book of Common Prayer to the Sacrament which is also called Holy Communion, Eucharist, or Liturgy. In the primitive Church it seems to have been celebrated either daily or weekly in connection with the Agapæ (q.v.), but before their abolition the Communion Service had become entirely distinct from them. At an early period the ordinances of the Church required its members to receive the Sacrament at the great yearly festival,

and it was also usual to partake of it on all occasions of more than ordinary solemnity. The practice has been maintained by all Christian bodies up to the present time, with the single exception of the Society of Friends; but from an early date widely divergent views have existed as to the exact meaning of the rite and the manner in which it should be administered. The source of the controversy regarding the "real presence" may be placed at least as far back as the 3rd century, when Origen maintained that the bread and wine are merely symbols, in opposition to the mystical view which then prevailed throughout the Church. Neither view, however, was distinctly formulated until the 9th century, when Paschasius Radbertus put forward the doctrine that by a miraculous process attending the consecration the substance (q.v.) of the bread and wine is transformed into that of the very body and blood of Christ. This doctrine received official sanction at the Council of Rome (1079), and is taught by the Roman Catholic Church at the present time. [TRANSUBSTANTIATION.] The reformers of the 16th century regarded this view as superstitious, but they differed widely amongst themselves. Luther, putting a literal interpretation on the words "This is My body," maintains that the body and blood are supernaturally present in the bread and wine, although not identical with them (consubstantiation). Zwinglius, on the other hand, declared that the words "this is" are equivalent to "this represents," so that the Sacrament is merely an act of commemoration, and the elements have only a symbolic significance. Calvin took up a position midway between the two, asserting that although the body and blood are not actually present in the elements, yet the faithful partaker is, in the act of receiving them, brought into union with Christ, through the inspiration of the Holy Ghost. This is the view now held by most Protestant Churches. The 28th Article of the Church of England asserts that "the body of Christ is given, taken, and eaten in the supper only after an heavenly and spiritual manner." The forms observed in the celebration of the rite, which vary greatly in different Churches, mostly have a doctrinal origin. Thus, the denial of the cup to the laity in the Roman Catholic Church is grounded on the belief that the bread as well as the wine is converted into the blood of Christ; and the elevation of the Host (q.v.) is intended not only to represent the exaltation of Christ after His death, but to display His body and blood as objects of worship to the congregation. [LITURGY, MASS.]

Lorelei, or LURLEI, a precipitous rock near St. Goar, on the Rhine, 427 feet in height. The legend, well-known from Heine's song, which makes it the abode of a siren who has lured many boatmen to their fate, is said to have been invented by Clemens Brentano.

Loretto, a town of Italy, 3 miles from the Adriatic, and 15 miles S. of Ancona, on the right bank of the Musone, is chiefly noted as containing the Holy House of Nazareth, which tradition states to have been miraculously moved, first to

Dalmatia, and then in 1295 to Loretto. The church of Santa Casa is in the centre of the town, and before it is a statue of Sixtus V., who made the town. The Casa itself is cased in marble, beautifully sculptured, and contains an image of the Virgin, said to be by St. Luke.

L'Orient, or LORIENT a port of France, on a bay in the department of Morbihan, 116 miles N.W. of Nantes. The port, which is well built and has a large deep harbour, was founded by the East India Company in 1664, and, coming eventually to the Government, has been since 1815 the chief ship-building port of France. It has dockyard and arsenal, schools of navigation and marine artillery, an observatory, and is fortified. There are also foundries, fitting-shops, rope-works, cooperages, and sailmaking establishments, and some exportation of sardines. The roadstead is formed by the estuary of the Blavet.

Loris (= *Stenops* = *Nyctiebus*), an East Indian genus of Lemurs, with two or three species, none much larger than a squirrel. The head is round, with a pointed snout, and large eyes. The fur is soft and thick, and usually brown in colour. They are nocturnal in habit, slow in movement, whence they are sometimes called Slow Lemurs, and feed on insects and small birds.

Lorraine, since 1871 a district between Metz and the Vosges, but in the Middle Ages a much more extensive region. As forming part of the German Empire in the 9th century, it comprised the land between the Scheldt, the Meuse, and the Rhine. In the next century its Count became a Duke, and in 954 it was divided into Upper and Lower, the latter of which became part of Brabant in the 13th century. Upper Lorraine retained its Dukes till 1736, when it passed to Stanislas, ex-King of Poland, becoming French in 1766. [ALSACE, GERMANY.]

Lory, any of the brush-tongued parrots from the Australian region. The general coloration is red and blue, though forms with green, brown, and black plumage occur. The extensile tongue serves to extract nectar and pollen from flowers.

Los Angeles, a town, capital of a county of the same name in South California, on the South Pacific Railway, lying between the Sierra Madre and the Pacific, 17 miles from the coast, and on the bank of a stream. It was a flourishing town in the 18th century, and from 1835-46 capital of California, but was taken in the latter year by the United States. It is chiefly renowned for its wine grapes, and fruit, especially oranges, and has two immense reservoirs for irrigation purposes. It is also a resort for invalids.

Lost Property. The law of finding lost property, after numerous contradictory decisions, has been determined by the Court of Criminal Appeal in the following way:—1. If a man find goods that have been actually lost, or are reasonably supposed by him to have been lost, and appropriates them with intent to take the entire property of them, really believing, when he takes

them, that the owner cannot be found, it is not theft. 2. But if he takes them with the like intent, though lost, or reasonably supposed to be lost, but reasonably supposing that the owner can be found, it is larceny. In the case on which the foregoing decision was come to the prisoner had found a bank-note, but had no means of knowing who was the owner. Afterwards he was informed who the owner was; but, notwithstanding this, he changed it and applied the money to his own use. He was held not to be guilty of larceny because when he found it he did not know that the owner could be found. This law applies to parcels, packets, or other chattel property, left by oversight or negligence in the possession of a stranger. They can be appropriated by the finder or possessor only in the entire absence of any likelihood or natural possibility of the real owner appearing or being found.

Lot, a department of southern France, part of the old province of Guienne, contains 2,012 square miles, divided into 3 arrondissements. The Dordogne and the Lot are its rivers. The plateau of the Cevennes in the E. slopes to the S.W., and the valleys are fertile. The chief productions are phosphate of lime, wheat, maize, tobacco, fruits, chestnuts, and especially wine, truffles, leather, wool. There is a good deal of sheep-breeding, and milling, tanning, and woollen manufacture are carried on. The river Lot, a tributary of the Garonne, rises in Mont Lozère, and flows W. to join the Garonne after a course of 300 miles.

Lot et Garonne, a province of south-west France, part of old Guienne and Gascony, contains 4 arrondissements, drained by the Garonne and its tributaries the Gers and the Lot, and is 62 miles long, with an area of 2,067 square miles. It is mostly fertile plain, except in the S.W., where it joins the Landes, and its chief productions are wheat, maize, colza, tobacco, wine, hemp, and plums, and timber. Poultry-rearing is largely carried on, and among the industries are metal-working, paper, woollen, and cork manufacture, distilling, and tanning.

Lothian, the tract of land lying between the Tweed and the Firth of Forth. From 547 to 1018 it belonged to Northumbria. It is now divided into East (Haddington), Mid (Edinburgh), and West (Linlithgow) Lothian. From it the Kers take their titles of Marquis and Earl of Lothian.

Lotion, a solution used for washing over or applying on lint to the external surface of the body; the mercurial lotions of the British Pharmacopœia are examples of this form of preparation.

Lotteries, any schemes for the distribution of prizes by chance, or for raising money by the sale of chances to share in a distribution of prizes; lotteries were declared illegal in England in 1826.

Lotus, a name applied generically by modern botanists to the birdsfoot trefoils, a group of Leguminosæ. The sacred Lotus of the East is *Nelumbium speciosum*, which belongs to the water-lily family. From its fleshy rhizome spring the tall peltate leaves and long-stalked flowers, both of which may

in early stages float on the water. The leaves are covered with fine hairs, so that the water rolls off them, and their stomates are confined to the centre of the upper surface. The numerous petals are either pure white or, more commonly, pink-tinted, and the enlarged funnel-shaped receptacle, in the upper surface of which the carpels are separately sunk, is most characteristic. It was aptly compared by Herodotus to a wasp's nest; but, though found from Australia and Japan to the Caspian, it no longer grows in Egypt, where he, Strabo, and Theophrastus mention it as occurring, and where ancient sculptures clearly attest its connection with the worship of Isis. It is still venerated by Buddhists. Both the rhizome and the seeds are edible. The present white and blue lotuses of the Nile are two species of water-lily, *Castalia Lotus* and *C. cerulea*. In a 12th-century manuscript of Dioscorides, whilst *Nelumbium* is represented under the name *kyamos*, the lotus, the food of the Lotophagi of Homer, appears as the fruit of *Celtis australis*, the nettle-tree of the Mediterranean region, a member of the elm tribe which bears a small, sweet, drupaceous fruit. It has, however, been plausibly suggested that the fruit whose lusciousness, according to Homer, made men forget their native land, was the date.

Lotze, RUDOLF HERMANN (1817-81), a German philosopher, was born in Saxony, and studied medicine and philosophy at Leipzig. In 1842 he was appointed professor of philosophy at Leipzig, and in 1844 to a similar post at Göttingen. His first writings were on physiology, and in them he was thought by some to favour materialism. In 1841 appeared his *Metaphysik*, and in 1851 a work on the general physiology of natural life. But his chief work was *Mikrokosmos* (1856-64), 3 vols. This has been translated, and sets forth his views of the nature of man. His *Logic* appeared in 1874, and a work on metaphysics in 1879. His views generally resemble those of Leibnitz, but show the influence of Hegel.

Loucheux, Franco-Canadian name of a North American people, who call themselves *Dinjie* ("Men"), and who are a branch of the Dene-Dinjie (Athabaskan) family. They roam the Mackenzie basin from about lat. 67° N. to the Eskimo domain, and have also extensive hunting grounds in Alaska, but number scarcely 8,000 altogether, scattered over a territory some 200,000 square miles in extent. Formerly they visited Fort Good Hope, hence known to the Canadian trappers as *Fort des Loucheux*, but they have now withdrawn farther north, and bring their peltries to the Hudson Bay Company's agents at Fort Macpherson. The Loucheux are the same people as the "Quarrellers," so named by the explorer Mackenzie because of their incessant wranglings with their Eskimo neighbours.

Loudon, JOHN CLAUDIUS (1783-1843), botanist and horticulturist, was born in Lanarkshire. In 1803 he published *Observations on laying out Public Squares*, and in 1805 a *Treatise on Hot-Houses*. Besides encyclopædias of gardening and plants

and other works on botany he published *Arboretum et Fruticetum Britannicum*.

Loughborough, a municipal borough of Leicestershire, near the Soar, with which it is connected by two canals, 11 miles N.W. of Leicester. It is the centre of a rich agricultural district, and was formerly noted for its malt. Among the public buildings are a 14th-century Decorated church with Perpendicular tower, grammar school, girls' school, free library, town hall, corn exchange, and infirmary. The chief industries are hosiery, bell-founding, iron-founding, dyeing, machine-, brick-, and glass-making, and coal-trading. The 17½-ton bell of St. Paul's was cast here in 1881.

Louis, SIR THOMAS, BART., English naval officer, was born in 1758 and entered the navy in 1770. He was made commander in 1781 and captain in 1783. He took part in the victory of the Nile, and in 1801 served on the coast of Egypt. In 1804 he was promoted to rear-admiral. In 1805, at Nelson's request, he was given a post in the Mediterranean, and he accompanied Nelson on the chase of the French to the West Indies and back. In 1806 he was second in command at Sir J. Duckworth's victory off St. Domingo, and was in consequence created a baronet, and in 1807, with the same officer as his chief, he passed the Dardanelles. He died in the same year.

Louis I., LE DÉBONNAIRE, Emperor of the West Franks, reckoned by French writers as the first King of France, born in 778, was the son of Charlemagne, by whom in 806 he was granted a third of his empire, with the title of King of Aquitaine. On the death of his father, in 814, he became sole ruler, his brothers having died. He made many enemies by his attempts at firm government, and in 817 put out the eyes of his nephew Bernard, King of Italy, who had revolted. In 821 Louis's own sons by his first wife rose against him on account of the favour he showed to Charles, son of the second, and he was compelled to take a share only of the government. The Germans, however, supported him, and his authority was re-established, but only to be destroyed by a second revolt in 832, when Louis was treated with great cruelty by his eldest son, Lothair. The other brothers reinstated him, but he died in 840 at the outset of a fresh war with his sons and his grandson Pepin.

Louis IX., called ST. LOUIS, was born in 1215, and was only nine years old when his father died. The regency was in the hands of his mother, by whom he was carefully educated, till 1236. The early years of the reign were occupied in defeating a combination of some of the vassals with Henry III. of England. The result of the war was the acquisition by France of part of Saintonge, which, however, with other territory, he gave back by the Treaty of Abbeville in 1259. After recovering from a severe illness, Louis in 1248 sailed from Aigues-Mortes for a crusade against the infidels, leaving Blanche of Castile as regent. He took Damietta, and penetrated into the country, but in 1250 he fell ill, and, while

retreating with his troops, was made prisoner by the Mussulmans. After his ransom he passed four years in Syria, fortifying Tyre and other ports, and returned to France at the end of 1254. Louis IX. abolished judicial combats, and instituted the Parlement de Paris as a supreme court of justice where the royal officers were to decide upon quarrels between the vassals of the crown and their vassals. Skilled lawyers were introduced into France, and with their help the *Établissements de Saint Louis*, a collection of ordinances dealing with the administration of justice, especially between debtor and creditor, were drawn up. By the issue of the Pragmatic Sanction Louis forbade the raising of money for the Pope in France without the king's consent. He also made the royal coinage current everywhere, and obliged the great vassals to keep order in their domains, while he kept a hold upon the towns by reserving to himself the right of choosing the mayor from four candidates submitted to him by them. In 1264 Louis was called upon to arbitrate between Henry III. of England and the barons, and decided in favour of the king. In 1270 he undertook a second crusade. He set out for Tunis with 60,000 men; but died of the plague after a month's illness. He was canonised by Boniface VIII. in 1297.

Louis XI. was born in 1423, and succeeded his father, Charles VII., in 1461. While Dauphin he strongly opposed the influence of Agnes Sorel (q.v.), and lived the life of a practically independent prince in Dauphiné. His reign is divisible into two periods, the one preceding and the other following the year 1472. The first period saw a struggle against the great vassals, calling themselves the League of the Public Weal, aided by Charles the Bold of Burgundy, who set up against Louis his brother Charles. By the Treaty of Conflans in 1465 Louis was obliged to give up Normandy to the latter, and to restore to Burgundy certain towns on the river Somme. He recovered Normandy soon after; but in 1468, having placed himself in the power of Charles the Bold at Péronne, was only released on condition of ceding Champagne to his brother and of putting down in person the rebel Liègeois, whom he had incited to revolt against Burgundy. He was saved from further humiliation by the death of his brother, between whom and the daughter of Charles the Bold a marriage had been projected by the enemies of Louis. The French king from henceforth took the offensive, stirred up the Emperor and the Swiss against Burgundy, and on the death of Charles the Bold seized his daughter Mary's dominions. An indecisive war ended with the adding of Burgundy and Artois to the French crown by the marriage of the Dauphin with Margaret, daughter of Mary. Roussillon was also acquired by Louis from Aragon; and Edward IV. of England was bought off in 1475 by a pension and the empty title of King of France. Louis XI. died in 1483. The three chief aspects of his character—his cunning, his superstition, and his *bonhomie*—are well depicted in Scott's *Quentin Durward* and in Banville's *Gringoire*.

Louis XII. was born in 1462, and succeeded Charles VIII. in 1498. The year after his accession he reunited Brittany to the French crown by marrying the widow of his predecessor. He claimed Milan, and possessed himself of it by the help of the Pope and Venice, but was deprived of it in 1513 by the Holy League and the Swiss. He also revived the claims of Charles VIII. on Naples, and obtained it by an alliance with Ferdinand of Aragon, but lost it in 1503. Five years later he joined the League of Cambray against Venice. An invasion of France by England, as one of the members of the Holy League, was followed by the "Battle of the Spurs" (Guinegate), and the marriage of Louis to Mary Tudor, sister of Henry VIII. Louis XII. died in 1515.

Louis XIII., son of Henri IV. and Marie de Medicis, was born in 1601, and succeeded his father in 1610. The queen-mother acted as regent until 1617, when the king assumed the government. During the next four years (1617–21) Louis was under the influence of the Duc de Luynes. In 1620 the re-establishment of Roman Catholicism in Béarn led to a fresh outbreak of the religious wars. By the Treaty of Montpellier (1623) the Edict of Nantes was confirmed, but the Huguenots lost their political privileges. For the next eighteen years (1624–42) the history of the reign of Louis XIII. is that of Richelieu and his policy. The Huguenots and the nobles were reduced to submission, the English attempt to relieve La Rochelle was defeated (1627), and the intrigues of Marie de Medicis were successfully met. In 1629 Louis was induced by Marie de Medicis to supersede Richelieu in favour of Marillac, but the cardinal speedily re-established his influence over the weak king by a personal interview. The only other serious attempt made to shake his power was the conspiracy of Cinq Mars in 1641. On the death of Richelieu in 1642 Mazarin became chief minister. Louis XIII. died in the following year. [RICHELIEU, MAZARIN, HUGUENOTS.]

Louis XIV., born in 1638, was still a child when he became king. He had been declared of age in 1651, but he took little part in the government till the death of Mazarin (q.v.) ten years later. The events which he had witnessed in his youth, and the counsels of Mazarin, set him firmly against constitutional government, and during more than half a century he was the actual ruler of France. He employed under him the old servants of Mazarin, but got rid of Fouquet (q.v.) as soon as the superintendent of finance showed that he aimed at the post of chief minister. The chief administrators under Louis were Le Tellier, and afterwards his son Louvois, Lyonne, and Colbert. A spirited foreign policy, successful at first, but in the end disastrous, was pursued. Charles II. and James II. became the pensioners of Louis, and the former restored Dunkirk for a sum of money. Pope Alexander VII. was humiliated, and the balance was held between England and Holland. In 1664 a contingent of French troops were sent to help Hungary against the Turks; and in the next year French troops secured the freedom of

Portugal from Spanish predominance. In 1667 Louis declared war against Spain, and, though compelled by the Triple Alliance to restore Franche-Comté, he retained his conquests in the Netherlands by the Treaty of Aix-la-Chapelle (1668). In 1672, having broken up by diplomacy the Triple Alliance, Louis overran Holland with his troops, but here met with the man who was to check his career of success, William of Orange. The taxation and distress caused by the war produced revolts in France, but in the course of 1678 and 1679 peace was made with every state. In 1681 the Chambers of Reunion awarded France practically the whole of Alsace, and in the same year Strasburg was seized; while in 1682 a synod of the clergy supported Louis against the Pope. In 1683, however, Louis lost his ablest minister by the death of Colbert, and two years later he deserted the traditions of the wisest French statesmanship by the revocation of the Edict of Nantes. In 1686 a league was formed against France by the Emperor, Spain, Sweden, and Holland, and was afterwards joined by other German princes and the chief states of Italy. It had, too, the secret support of the Pope, offended by the extension of the *régale* and the arrogant claims of the French Embassy in Rome, and after the Revolution of 1688 England also formed part of it. During the war, which lasted from 1689 to 1697, France had sometimes as many as six armies in the field, and Louis and William III.—the most powerful men in Europe—faced each other in the Netherlands. The question of the succession to the Spanish throne caused the last great war of the reign. At the Peace of Utrecht (1713) Philip, Louis' grandson, had to renounce the French crown, and to give up to England Gibraltar and Minorca, while the same power was ceded important possessions in North America by France; and Holland was secured from further aggression on the part of the latter. In the subsequent treaties with the Emperor and Austria France fared rather better. Louis XIV. died in the autumn of 1715. Since the death of Louvois, Madame de Maintenon, whom he had secretly married, had chiefly influenced him. [MAZARIN, COLBERT, HUGUENOTS, ETC.]

Louis XV., born in 1710, was the second son of the Duke of Burgundy, and the great-grandson of Louis XIV. His reign, like that of the two preceding, began with a regency, Philip, Duke of Orleans, being the regent. From 1723–26 Bourbon, the grandson of Condé, was chief minister. By him the young king was married to Marie Leczinska, daughter of the ex-King of Poland. Bourbon's selfish and oppressive government caused his removal in 1726, and for the next seventeen years (1726–43) the policy of France was directed by Fleury (q.v.). After the death of the old cardinal, Louis declared he would be his own minister; but in promising French support against England to Spain he allowed his own judgment to be overborne by that of Maurepas (q.v.). In 1744 he reached the height of his popularity when he took the command of his army in Alsace against the Austrians. On his recovery

from a dangerous illness at Metz he was saluted with the title of "le Bien-aimé." At the peace of Aix-la-Chapelle, however, in 1748, France had to give up Madras to England, to evacuate the Netherlands, and to acknowledge Maria Theresa's husband as emperor. England again became the chief enemy of France, and almost continuous war was waged between them in India and North America. In 1756 open war again broke out in Europe, but France was now allied with Austria against England and Prussia. Madame de Pompadour and Stainville, Duc de Choiseul (q.v.), now directed French policy. Choiseul was succeeded by an incapable triumvirate consisting of Maupeou, the Abbé Terrai, and the Duc d'Aiguillon. The first, who was Chancellor, abolished the Parlements, and set up a council of his own nomination to take their place—a proceeding which was approved by Voltaire, but suspected by the people as a step towards tyranny. For some time past Louis XV. had been sunk in debauchery, and he died execrated and deserted in 1774.

Louis XVI. was born in 1754, and succeeded his grandfather twenty years later. The triumvirate were immediately dismissed, and Maurepas, an old minister of Louis XV., placed at the head of affairs. Turgot (q.v.) was made controller of the finances, Malesherbes became Chancellor, and Vergennes foreign minister. The first was overthrown by a combination of the queen, the privileged classes, and Necker; and the Chancellor was forced to resign even before his colleague. Necker (q.v.) succeeded to the virtual control of the finances, though being a Protestant he could not nominally hold office, but he resigned in 1781. Vergennes, the foreign minister, nominally took his place, but all his attention was devoted to the policy of revenge upon England, which he attempted to carry out by alliance with the Americans and with Spain and the maritime powers in Europe. The war was hardly successful, and its financial results were disastrous, and hastened the Revolution. During the three years of Calonne's administration (1783–1786) the deficit increased by 35 millions, and the Assembly of Notables (which he assembled early in 1787) refused to sanction the measures by which he proposed to increase the revenue. Brienne, who had led the opposition, took Calonne's place and tried to force through the very measures he had just opposed. The Parlement demanded the summons of the States-General; and, though Orleans was exiled and two of the most violent members of the Parlement were arrested, this only increased its popularity, and the extreme step had to be taken of the creation of a Cour Plénière, to which its political functions were transferred. This provoked risings in Dauphiné and other provinces, and at the end of 1788 Brienne resigned, and the convocation of the States-General in the following May was promised. Necker was summoned to take the direction of affairs, and under his auspices the question of the constitution of the States-General was settled. On May 5th, 1789, they met, 578 of the 1,139 deputies belonging to the *tiers état*. Their formation into a single National Assembly, which

was not to separate until the national demands had been conceded, was met by an attempted *coup d'état* and the dismissal of Necker, the king always being swayed by a stronger will than his own. The taking of the Bastille, the recall of Necker, and the drawing up of a constitution which reduced the royal power almost to a shadow, followed. In the early summer of 1791 the king and queen escaped from the Tuileries and attempted to reach Varennes, a town on the eastern frontier, where there was a Royalist army; but Louis was recognised by the postmaster of St. Menehould and brought back with his family to Paris. On August 10th, 1792, the monarchy was overthrown, and, after a trial by the Convention, Louis XVI. was guillotined on January 21st, 1793.

Louis XVII. CHARLES, second son of Louis XVI. and Marie Antoinette, is sometimes so-called. He was born in 1785, and on the death of his elder brother in 1789 became Dauphin. Confined in the Temple Prison with Marie Antoinette in 1793, he was afterwards separated from her, and in all probability died on June 8th, 1795. As, however, it was known that attempts had been made to effect his escape from the Temple, a belief arose that the Dauphin was not really dead, and many pretenders to the title of Louis XVII. appeared, some of them gaining much credit among the Royalists. The most notorious of these were Hervagault, Brumeau, François Hébert, and Karl Wilhelm Naundorf, whose descendant still keeps up his pretensions in Holland.

Louis XVIII., brother of Louis XVI., was, during the reign of the latter, known as "Monsieur" and Comte de Provence. After leaving Paris in 1792, he did not, like the Comte d'Artois, join the *émigrés*, but passed the years of his exile at Hartwell, in Buckinghamshire. On the abdication of Napoleon in 1814 he was restored, and on June 2 published the charter of a new constitution, by which constitutional government was established, but the king reserved the initiation of legislation. On the news of the landing of Napoleon in the following March, and the desertion to him of Ney and Soult, Louis fled to Ghent, but returned to Paris after Waterloo. Though compelled by the clamour of the ultra-Royalists to dismiss Talleyrand and Fouché and to put Ney to death, Louis was determined not to be too reactionary. The moderate Ministry of the Duc de Richelieu was strengthened by the diminution of the indemnity to be paid by France and by the evacuation of her territory five years before the time agreed upon. In addition to this, France was readmitted to the councils of the Great Powers; but the policy of moderation was destined to failure. The Chamber of Deputies had to be renewed to the extent of a fifth annually, and when in 1818 Lafayette, Manuel, and Benjamin Constant were returned, Decazes succeeded Richelieu as head of a purely Liberal ministry. The censorship of the press was abolished, and 60 new peers were created in order to obviate opposition from the Upper House. By Villèle, however, the law respecting the renewing of the Chamber was repealed, and it was empowered to sit for 7 years.

and the Comte d'Artois became virtually ruler of France. Their Government also gained prestige by a successful intervention in Spain in 1823, by which Ferdinand VII. was enabled to hold his own against the Liberals. In 1824 Louis XVIII. died, and his brother became the nominal as well as real ruler of France.

Louis Philippe, King of the French, was the son of the Duke of Orleans (Égalité) and Louise de Bourbon, a descendant of Madame de Montespan. He was born in 1773, and educated by Madame de Genlis (q.v.). In the days of the first revolution he was a Jacobin, and served with distinction at Valmy and Jemappes. After the defeat of Neerwinden he went over with Dumouriez to the Austrians, but refused to serve against his country, preferring to become a tutor under the name of Chaband Latour in Switzerland. After passing three years in America he came to England in 1800 and lived at Twickenham for several years. In 1809 he married Amélie, daughter of Ferdinand IV. of Naples, and remained in Sicily for some time afterwards. At the Congress of Vienna in 1814 he was suggested as a candidate for the French throne, but was passed over in favour of the elder branch, to whom he always protested his fidelity, which was always, however, suspected. Louis Philippe again retired to England in 1815, but from 1817 to 1830 lived at the Palais Royal, giving his support to the Liberal party. During the Revolution of July, 1830, he kept very quiet, and accepted from Charles X. the post of lieutenant-general of the kingdom; but in August he accepted the crown offered him by the Chamber of Deputies. Laffitte, Casimir Périer, and Thiers were Louis' ministers, but Lafayette, who had had an equal share in the Revolution, was got rid of. Revolutionary outbursts took place in 1831 at Lyon, and in 1832 at Paris, and these were repeated in 1834, while the Duchess of Berri attempted a Legitimist rising in La Vendée. The attempt of Fieschi on the king's life in July, 1835, which was only one of seven, was followed by the enactment of severe repressive laws, and the government became despotic in character. From 1840 till 1848 Guizot conducted the Government. On February 22, 1847, the third French Revolution began with a great banquet which the leaders of the Opposition had arranged, and were not able to abandon. Next day the mob marched on the Tuileries, and the king tried to mend matters by again calling Thiers to his counsels and agreeing to Liberal measures. It was, however, too late; he was obliged to abdicate and to leave Paris under escort as quickly as possible. On March 3 the royal family landed at Newhaven, and two years later, in 1850, the Citizen King died at Claremont. Louis Philippe resigned his claims in favour of his grandson, the Comte de Paris (q.v.); his eldest son, the Duke of Orleans, had died from the results of a carriage accident in 1842. [GUIZOT, LOUIS BLANC, THIERS.]

Louisa of Prussia (1776-1810), the daughter of Charles of Mecklenburg-Strelitz, was born in

Hanover. In 1793 she married the Crown Prince of Prussia, afterwards Frederick William III., and was the mother of Frederick William IV. and the Emperor William. She had great qualities of mind and body, and was very popular. After the battle of Jena her active patriotism was especially conspicuous, as was her bearing in the face of Napoleon's insulting accusations. She is commemorated by a statue and monument at Charlottenburg, and gives her name to a Prussian order.

Louisiana, a state of America on the N. of the Gulf of Mexico. It is on the right bank of the Mississippi, and is traversed by the Red, Sabine, Washita, and Pearl rivers, and has Mississippi on the E., Tennessee on the W., and Arkansas on the N. The length from north to south is 200 miles, with a breadth of 290 miles and an area of 43,000 square miles, much of which is alluvial, varied by sandy pine hills and uplands rising to a height of 470 feet. For several miles inland there are tide-covered marshes, and the lowlands generally are protected by dykes ("levees") from inundation. The uplands are in the N. and N.E., and in other parts there are bluffs, and isolated hills rising from the plain, and interspersed with watercourses called bayous. Much of the marshland has been reclaimed and sown with rice. The climate generally is moderate, and the rainfall abundant, while the vegetation is very luxuriant, and there are forests of pine, oak, beech, poplar, cypress, cotton-wood, and magnolia. Oranges, figs, and other fruits are abundant, and cotton, sugar, and maize are grown. Among the industries are rice-cleaning, sugar-refining, shingle, tank- and machinery-making, and the manufacture of tobacco, boots, and clothing. The negro element outnumbers the white, which is mostly of French and Spanish origin. The state, which belonged to France, was sold to the United States by Napoleon in 1803, and is still governed by the civil law based upon the Code Napoléon. There is a State university at Baton Rouge (the capital), and another university at New Orleans.

Louisville, in Kentucky, a port and capital of Jefferson county, on the Ohio, near the Falls of Ohio, where the river sinks 22 feet in 2 miles, and 130 miles below Cincinnati. The town, which is well built, is on a plain sloping towards the river. Louisville is the chief tobacco-market of the world, and other industries are pork-packing, distilling, tanning, gas- and water-pipe making, and machinery, casting, and cement works. Several railway lines converge hither, and the Ohio is crossed by two railway bridges.

Lourdes, a French town in the Hautes-Pyrénées, 12 miles S.W. of Tarbes, is chiefly noted as a place of pilgrimage, owing to the presence of a miraculous healing spring which burst forth at the command of the Virgin, who appeared to a peasant girl, named Bernadette Soubirous, in 1858. So runs the legend. There is a basilica and a Church of the Rosary, and many pilgrims resort to the spot, especially in August. There are marble and slate quarries, and some prehistoric caves in the

neighbourhood. The Romans had a castellum on the rock at whose foot Lourdes is situated.

Louth. 1. A maritime county of the province of Leinster in Ireland, extending from the river Boyne to Carlingford, and having a coast-line on the Irish Sea. Its average width is 10 miles, and its area 202,000 acres, 40 per cent. of which is grass-land. The surface generally is flat except in the neighbourhood of Carlingford, and the coast-line is low and sandy save where Clogher Head rises to a height of 180 feet. Cultivation is advanced, and good potatoes, oats, barley, and turnips are grown. Coarse linen is manufactured, and oyster and other fishing is carried on. The county returns two members to Parliament. Drogheda and Dundalk are important towns. The county is rich in Celtic and other antiquities, among which are the sculptured crosses at Monasterboice, round towers at Monasterboice and Dromiskin, and ruins of abbeys in various places.

2. A town of Lincolnshire, on the Lud, 25 miles N.E. of Lincoln, and connected by canal with Hull. Much agricultural implement- and machinery-making is carried on, and there is a well-endowed grammar school.

Louvain (Flem. *Leuven*), a town in the Belgian province of Brabant, 19 miles E. of Brussels. In the 14th century it was extensive, rich, and prosperous, and a great seat of the cloth industry, but a revolt in 1382 drove its cloth-workers to England and caused the town to decay. The walls are now demolished, and much of the former city is now occupied by gardens. The university was once greatly famed, and Louvain has still the chief Catholic university of Belgium. Brewing is the chief industry, and there is some bell-founding, and manufacture of paper, lace, leather, and chemicals. The hotel de ville dates from the 15th century; St. Gertrude's church has some beautiful carved oak stalls, and in St. Peter's church is a notable roodloft, and some metal work of Quentin Matsys.

Louvois, FRANÇOIS MICHEL LE TELLIER (1641-91), was born at Paris, and his father was Chancellor and Secretary for War. The son became Minister of War in 1668, and so reorganised the army as to be entitled to the name of its founder. He introduced the principle of a standing army, and forced the nobles to enter as officers, and he also organised the commissariat and hospital arrangements. The officer (Martinet) who aided him in carrying out the arrangements has become proverbial.

Louvre (French, "the opening,") a small turret, more or less open at the sides, formerly erected on halls, kitchens, etc., as a means of ventilation and affording egress to the smoke.

Lovat, SIMON FRASER (1667-1747), a Scottish nobleman, was born in Ross-shire. In 1683 he graduated at Aberdeen, and was a good classical scholar. In 1694 he received a commission in King William's army, and in 1699 succeeded to the title, having meantime been outlawed for abduction. He appears to have played a double game in politics

between the Government and the Jacobites, and lost his head after the rising of the 'Forty-five.

Love-Bird, any small parrot of the African genus *Agapornis*, so called from their fondness for their mates. The term is also applied to the allied genus *Psittacula*, from tropical America, and to budgerigars (q.v.).

Lovelace, RICHARD (1618-58), an English poet whose claim to remembrance lies in his writing *To Althea from Prison*, *To Lucasta*, and one or two other charming lyrics. He was born at Woolwich, and educated at Charterhouse and Oxford. In 1642 he was imprisoned by Parliament, and prevented from aiding the king, save with his money. In 1648 he was again imprisoned, but set at liberty after the king's death. A tragedy called *The Soldier*, and a comedy, *The Scholar*, are lost, but *Lucasta* and *Posthume Poems* remain.

Lover, SAMUEL (1797-1868), was born in Dublin. He at first distinguished himself as a marine- and miniature-painter, having Lord Brougham as a sitter, and exhibiting a portrait of Paganini at the Royal Academy. In 1832 he published *Legends and Stories of Ireland* (illustrated by himself), in 1836 *Rory O'More* (which he dramatised), and in 1842 *Handy Andy*. In 1837 he came to London to work, but failing sight compelled him to confine his efforts to a series of entertainments called "Irish Evenings." Besides making a collection of lyrics of Ireland, he wrote *Molly Barn*, *The Low-backed Car*, and *The Four-leaved Shamrock*.

Lowe, SIR HUDSON (1769-1844), was born in Galway. In 1787 he entered the army, and for some years served in the Mediterranean. Then he joined the Prussian army under Blücher. Later, in his capacity of Governor of St. Helena, he had the care of Napoleon, and was much criticised on account of his alleged severity towards his prisoner. In 1825 he was appointed to a command in Ceylon.

Lowell, a manufacturing town in the north of Massachusetts, U.S., 25 miles N.W. of Boston. It is situated on the Merrimac, which is here joined by the Concord, and forms a centre in which five railways converge. Lowell is the chief seat of the cotton manufacture in the United States; there are also important woollen and linen factories, powder-mills, paper-mills, works for the manufacture of machines, etc. These factories are mostly worked by water-power derived from the Merrimac, which here has a fall of over 30 feet, but steam power is also largely employed. The mill-hands are remarkably prosperous and intelligent, and there are numerous literary clubs and similar institutions.

Lowell, JAMES RUSSELL (1819-91), American man of letters, was born at Cambridge, Massachusetts. After completing his education at Harvard, he was called to the bar, but never practised. His first volume of poetry, *A Year's Life* (1841), was followed three years later by another volume containing several fine pieces. *Conversations on some of the Old Poets* (1845) gave indication of his powers of literary criticism, whilst

his reputation as a poet was much increased by the *Indian Summer Reverie* and the *Vision of Sir Launfal* (1848), founded on the legend of the search for the Holy Grail. *A Fable for Critics* (1848) is a witty but good-humoured satire on certain well-known American authors. But the chief work of this period was the *Biglow Papers* (1846-48), in which the Mexican War is presented in the most unfavourable light; these compositions are remarkable alike for their keen humour, their satirical force, the justice of their political views, and their insight into the characteristics of the rural population of America. The second series (1864), occasioned by the War of Secession, are less humorous, but display a loftier vein of sentiment. In 1855 Lowell succeeded Longfellow as Professor of Modern Languages and Literature at Harvard. He edited the *Atlantic Monthly* from 1857 to 1862, and the *North American Review* from 1864 to 1866. Of his remaining works the most important were the volumes of critical essays entitled *My Study Windows* (1871) and *Among my Books* (two series, 1870, 1876). Lowell was United States minister to Spain from 1877 to 1880; in the latter year he was transferred to England, but was recalled on the fall of the Republican party, and returned to America in 1885. His *Democracy* and other addresses delivered in England were republished in 1886.

Lowth, ROBERT (1710-87), a learned English prelate, was educated at Winchester and Oxford, where he became professor of Poetry in 1741. He was appointed Bishop of Oxford in 1766, and of London in 1777. His chief work was his *Lectures on the Sacred Poetry of the Hebrews* (1753), written in Latin.

Loxia. [CROSSBILL.]

Loyola, IGNATIUS DE (IÑIGO LOPEZ DE RECALDE) (1491-1566), founder of the Society of Jesus, was descended from an illustrious Spanish family, and was born in the province of Guipuzcoa. After living at the Court as a page, he entered the army, and for many years led the gay life of a soldier. At the siege of Pampeluna by the French (1521) one of his legs was fractured by a cannon ball, and the other was injured by a splinter of stone; and he was removed to the castle of Loyola. During his confinement he amused himself by reading romances, and when these were exhausted had recourse to the *Life of Jesus* and the *Lives of the Saints*. His spiritual nature was gradually awakened, and he determined to devote himself to a life of religion. His first project was a pilgrimage to Jerusalem, but before undertaking it he repaired to Catalonia, where he passed a year amongst the poor in St. Lucy's hospital at Manresa. It was here that he composed the celebrated *Spiritual Exercises*. The difficulties he encountered during his pilgrimage (1523-24) in his efforts to convert the infidels induced him to qualify himself for the office of instructor by a renewed course of study. After studying Latin under Jerome Ardebal, at Barcelona, he resided at the universities of Alcalá and Salamanca; but he aroused the hostility of the Inquisition by persisting in delivering public

discourses, and, after spending some time in prison, removed to Paris in 1528. Whilst a poor student at Paris he became acquainted with Xavier, Lainez, and other kindred spirits, with whom he united to form the society which was subsequently organised as the Jesuit order. After some difficulty and delay the Papal sanction to the foundation of such an order was obtained in 1538, and confirmed by a Bull in 1540. In 1541 Loyola was chosen general with absolute power. The remainder of his life was spent at Rome. [JESUITS.]

Lozère, a department of south France, bounded by Cantal, Haute-Loire, Aveyron, Gard, and Ardèche; area 1,996 square miles. The surface is rugged and mountainous, consisting mainly of a plateau from 2,300 to 3,000 feet above the sea-level; in the S.E. are the Cevennes, containing Mont Lozère (4,884 feet), from which the department takes its name. Numerous rivers rise within the department, flowing to the Garonne, Rhone, and Loire. In general the climate is too severe for corn, but sheep are reared in large numbers, and chestnuts and potatoes are important products.

Lubbock, SIR JOHN (b. 1834), man of science and social reformer, was born in London and educated at Eton. At the age of 14 he entered his father's bank in Lombard Street. Several useful banking reforms are due to him; but his reputation rests chiefly on his works dealing with insect life and primitive man. These include *Pre-historic Times* (1865), *The Origin of Civilisation* (1870), and *Ants, Bees, and Wasps* (1882). *The Pleasures of Life* (1887) has had a wide circulation. Sir J. Lubbock was Liberal member for Maidstone from 1870 to 1880, since when he has represented the University of London (since 1886 as a Liberal Unionist). Of the numerous measures passed by him the most important is the Bank Holiday Act (1871), which added four annual public holidays to the two already existing.

Lübeck, a free city of Germany, 40 miles N.E. of Hamburg by railway. It lies in a hollow at the foot of a hill, between the Trave and the Wakenitz, about 10 miles above the mouth of the former. The territory belonging to the town covers some 115 square miles, and includes the port of Travemünde, situated at the point where the Trave falls into the Baltic. Lübeck was founded by the Saxons in the 12th century, near the site of the old Slavonic or Wendish town of Liubice. It was made a free city by Frederick II., and played a prominent part in the history of the Hanseatic League (q.v.), the fall of which led to its own decline. Lübeck joined the North German Confederation in 1866, and the Zollverein in 1868. It is governed by an executive body, consisting of fourteen senators chosen for life, and a legislative house of burgesses containing 120 members. The town wall was levelled in 1802, and converted into walks and gardens. The most notable buildings are the cathedral, begun in 1173, which contains a fine altar-piece; the church of St. Mary, dating from the early part of the 14th century, with two towers over 400 feet in height; the town-hall, the

school of navigation, and the public library. Lübeck is an important centre of the carrying trade of northern Europe generally, but especially of that between the interior of Germany and the shores of the Baltic. There are cigar factories, breweries, distilleries, iron-foundries, etc., but none of the industries are very important.

Lublin, a government in the S.E. of Russian Poland, area 6,497 square miles. The capital, Lublin, is situated on the Bistritza, 96 miles S.E. of Warsaw. The cathedral dates from the 13th century. There is an extensive trade in wool and corn. About half the inhabitants are Jews.

Lubrication. When two solid bodies are rubbed together heat is produced and work wasted. To reduce this waste, rubbing surfaces in machine bearings, etc., are lubricated by inserting a film of fluid between them. This film of fluid prevents the surfaces from actually touching, and the friction between each surface and the fluid is much less than would be the case if the lubricant were not present. The fluid is usually oil, and this should be chosen of such a consistency that the pressure on the bearing will not force it from between the surfaces; heavy bearings must thus have thicker oil than light ones. Tallow and thick vegetable or mineral greases are used for heavy bearings, such as those of railway carriages; petroleum of various degrees of thickness are largely used for general machinery, while refined sperm or neatsfoot oil is used for small work, such as the pivots of sewing-machines and clocks.

Lucan (MARCUS ANNÆUS LUCANUS), (39-65 A.D.), Roman poet, was the son of L. Annæus Mella, a brother of the philosopher Seneca. He was born at Corduba, in Spain, but at an early age his parents took him to Rome, where he was educated by the foremost teachers of the day. At first he was favoured by the Emperor Nero, who made him quæstor and augur; but he incurred his enmity by defeating him in a public literary contest, and was forbidden henceforward to recite or publish his poems. Hereupon he threw himself into the conspiracy of C. Calpurnius Piso. The plot was discovered, and he sought to save his life by turning informer, accusing even his own mother, Acilia; but his efforts were fruitless, and he was forced to commit suicide by opening his veins. His fame rests entirely on his *Pharsalia*, an epic poem describing the war between Cæsar and Pompey, which terminates abruptly in the middle of the 10th book. It is characterised by an easy flow of language, which sometimes rises into eloquence; the sentiments are generally patriotic, and almost everywhere it breathes the lofty Stoic philosophy in which its author had been trained. On the other hand, many passages are marred by an undue straining after verbal effect.

Lucanidæ, the family of beetles of which the Stag Beetle (q.v.) is the type.

Lucas van Leyden (LUCAS JACOBSZ), (1494-1533), a celebrated Dutch painter and engraver, born at Leyden. His best picture is the *Last Judgment* in the town-hall at Leyden.

Lucca, a province of north Italy, extending northwards from the Arno; area 544 square miles. The soil is fertile, and the olive and other kinds of fruit are largely cultivated; the caper is a special product of this district. The chief town, Lucca, stands on a plain beside the Serchio, 11 miles N.E. of Pisa. The Duomo, a fine edifice dedicated to St. Martin, was begun in the 11th century; it contains some valuable paintings and interesting relics. There are several other handsome buildings, and a large number of churches, chiefly built of Carrara marble. The aqueduct of 459 arches, conveying water from the Pisan Hills, was constructed in 1820. Lucca is the seat of an archbishop. The celebrated mineral baths are situated in the valley of the Serchio, some 12 or 15 miles to the N. The silk manufacture, established here in the 11th century, is still thriving, and olive-oil is exported in large quantities.

Lucerne, a Swiss canton, bounded by those of Aargau, Zug, Bern, Unterwalden, and Schwyz; area 579 square miles. The surface, which is flat or gently undulating in the N., rises in the S. to meet the Bernese Alps, reaching in Mount Pilatus a height of 6,998 feet. Cattle-rearing and dairy-farming are carried on in the mountainous districts, and where the soil is more fertile corn and fruit are grown. The inhabitants speak German, and for the most part belong to the Church of Rome.

The LAKE OF LUCERNE—called also the “Lake of the Four Forest Cantons,” viz. Lucerne, Schwyz, Unterwalden, and Uri—is a magnificent sheet of water of very irregular form, somewhat resembling a roughly-hewn cross; the area is 44 square miles. The scenery towards the N. and W. is of a gentle pastoral character, but, as the banks become more rugged and precipitous, it increases in grandeur, and the most beautiful part of the lake is that which lies within the canton of Uri.

The town of LUCERNE is picturesquely situated at the N.W. end of the lake, where the Reuss issues from it. It is much frequented by tourists. Outside the walls is the Lion of Lucerne, designed by Thorwaldsen and cut out of the solid rock as a memorial of the Swiss Guards slain at the Tuileries in 1792.

Lu-Chu, the inhabitants of the Lu-Chu (Liu-Kiu, Riu-Kiu) archipelago between Japan and Formosa; apparently of Japanese stock, but showing Corean affinities in their habits and traditions. The language is an archaic form of Japanese, akin to the Satsuma dialect; it has never been cultivated, and the so-called “Lu-Chu” version of the Bible is really composed in pure Japanese. All are Buddhists, and are noted especially for the respect shown to the dead (a reminiscence of ancestor-worship), who are deposited in large and sumptuous tombs for three years, after which the remains are collected and preserved in urns. (Basil Hall, *Voyage, etc., to Corea and the Great Loo-Choo Island: Church Missionary Intelligencer*, August, 1879.)

Lucianus, or LUCIAN (*circa* 120–200 A.D.). a humorous Greek writer, was born at Samosata, on

the Euphrates, in the Syrian district of Commagene. After practising as an advocate at Antioch, he travelled through Greece, Italy, and Gaul, acquiring much wealth by his rhetorical displays. At the age of forty he returned to his own land, and there wrote his principal works, which are mostly in the form of dialogues. During the latter part of his life he was procurator of part of Egypt. Some of Lucian's most amusing compositions were written with the express purpose of throwing ridicule on the decaying religion and philosophy of the age. To this class belong the *Dialogues of the Gods*, the *Sale of the Philosophers*, the *Banquet*, and the *Icaro-Menippos*, which describes a journey to Olympus by way of the moon, undertaken by a dissatisfied student of philosophy in quest of truth. The chief interest of other dialogues, such as the *Timon*, consists in their graphic account of contemporary social life. The famous *Dialogues of the Dead* are intended to show the emptiness of everything which seems precious to mankind. Lucian had a wide experience of human nature, and a wonderful faculty of producing grotesque images and ideas. His narrative is always extremely lively, and the purity of his language approaches that of the best Attic.

Lucifer Matches. [MATCHES.]

Lucigen is an apparatus for producing an intense light by combustion of crude paraffin and other cheap oils. The oil is contained in an iron vessel, from which it is forced by compressed air in the form of spray, which burns in a suitable burner. A store of compressed air is usually retained ready for use in an iron cylinder. There are many different forms, which vary in details of construction.

Lucilius (*circa* 148–103 B.C.), the first Roman satirist, was born at Suessa Aurunca, in Campania. He was the intimate friend of Scipio Africanus, whom he accompanied to the siege of Numantia, and of Lælius. Fragments of his *Satires* remain.

Lucknow, a city of India, capital of the province of Oudh (q.v.), on the Gúmti, 42 miles N.E. of Cawnpur. Viewed from the outside, the town presents an imposing appearance; but in reality the streets are narrow and crowded, and the buildings, which produce a striking effect from a distance, are seen on a nearer view to possess all the worst faults of architectural design. The most magnificent edifice is the Imámbára or mausoleum of Asaf-ud-daulá, the fourth Nawáb of the Oudh dynasty, erected in 1784. There are also two fine mosques, four gorgeous royal tombs, two large palaces, an observatory, etc. Canning College was established in 1864. The Martinière College is intended for the sons of soldiers, and has a branch for the education of girls. The manufactures include gold and silver brocade (made from small wires), muslins and other textile fabrics, glass-work, and moulding in clay. There are also railway workshops and a paper factory, and the town has a large trade in grain, cotton, salt, molasses, and leather. Lucknow is memorable for the gallant defence maintained by the garrison during the Mutiny; it was besieged by the rebels from July, 1857, to March,

1858, when they were finally defeated by Sir Colin Campbell. [LAWRENCE, OUTRAM.]

Lucretius, CARUS TITUS (*circa* 95-52 B.C.), an eminent Roman poet, concerning whose life nothing certain is known. His *De Rerum Natura*, a didactic poem in hexameter verse, contains six books, in which are expounded the principles of the Epicurean system of philosophy. It is, perhaps, the sole example of a philosophical poem in which the didactic purpose is successfully maintained without destroying the literary value of the work. This is the more remarkable as the materialistic character of the views enforced might naturally be supposed to be very repugnant to the poetic temperament. Yet the poem contains passages which for beauty and grandeur are unequalled by anything else in the whole range of Latin literature. Lucretius is said to have been driven mad by a love philtre, administered by his wife, and to have committed suicide; but some think that this story was invented by his enemies.

Lucullus, L. LICINIUS (*circa* 110-58 B.C.), Roman general, served as quæstor under Sulla in the first Mithradatic War (88-84), elected consul in 74, he received Cilicia as his province, and prosecuted the war against Mithradates, expelling him from Pontus, and defeating Tigranes, King of Armenia, with whom he had taken refuge. But the insubordination of his troops prevented him from bringing the war to a successful close, and in 66 he was superseded by Pompey. After his return to Rome he became noted for his luxurious mode of life.

Luddites, the name assumed by the rioters in Yorkshire and other northern and midland counties, who, in 1811-12, and again in 1816, destroyed all the machinery on which they could lay their hands, supposing that its introduction had caused the prevalent distress. The name was taken from Ned Ludd, a Leicestershire idiot, who had destroyed some stocking-frames about thirty years before.

Ludlow, EDMUND (1617-92), was born of a good family in Wiltshire. He was educated at Oxford, and in 1638 became a student in the Temple. After serving in the Parliamentary army, he was elected member for Wiltshire (1646), and at once joined the extreme party. He succeeded Ireton as commander-in-chief in Ireland, but after six months was superseded by Fleetwood (July, 1652). In consequence of his resistance to Cromwell's usurpation he was imprisoned in 1655, but he was subsequently allowed to retire to Essex. He was instrumental in securing the return of the Rump, and again held the chief command in Ireland for six months in 1659. In August, 1660, he escaped through France to Switzerland, and eventually settled at Vevey, where he died. His *Memoirs* were first published in 1698-99.

Lugano, a lake, partly in the Swiss canton of Ticino and partly in Lombardy. It lies to the south of the Alps, nearly 900 feet above the sea, and is 15 miles long from N.N.E. to S.S.W., with an extreme breadth of two miles. The banks are steep, lofty, and well wooded, and the scenery in

many parts is very grand. On the N.W. side, in the Swiss portion, stands the town of Lugano, surrounded by vineyards, olive plantations, and chestnut woods; the church of Sta. Maria degli Angioli contains paintings by Luini.

Lugger, a vessel of one, two, or three masts, carrying on each a quadrilateral lug-sail bent upon a yard that hangs to the mast obliquely, from a point at about one-third of its length. There is generally a running bowsprit; and large luggers have two or three jibs, as well as lug-shaped top-sails. Many ships' boats are rigged as luggers, such boats doing well when close-hauled, and sailing very near the wind.

Lughmani, the natives of the Lughman district, Jalalabad, north-east Afghanistan; they are said to be chiefly Ghilzaes and Tajiks, though speaking a language closely allied to that of the Siah Posh Kafirs (Kafiristan), and nearly the same as the Pashāe and Kohistani north of Kabul. All these are Galcha tongues intermediate between the Iranian and Sanskritic families.

Luina, a Bantu people of south central Africa, who occupy the Upper Zambesi plains, and especially the kingdom of Lui, formed by the dismemberment of the Makololo empire. It was the Luina nation that was chiefly instrumental in overthrowing this state, and restoring the old Barotse power in the Zambesi basin. Unlike most Bantu peoples, the Luina are rather stock-breeders than tillers of the soil. They own large herds, and are also skilful workers in iron, making all their own weapons and utensils; but at the time of Serpa Pinto's visit (1878) they had greatly degenerated, and polygamy had become universal. By the recent treaties with the Chartered South Africa Company (1892) the Luina have been brought within the sphere of British influence. [MAKOLOLO.]

Luini, or LOVINI, BERNARDINO (*circa* 1470-1530), a painter of the Lombard school, was born at Luino, in the territory of Milan. His works closely resemble those of Leonardo da Vinci. Some of his best paintings are in the Ambrosian Gallery at Milan, some at Lugano (q.v.).

Luke, SAINT, the evangelist and supposed author of the Acts of the Apostles, was, according to a tradition recorded by Eusebius, Jerome, and others, a native of Antioch in Syria. He accompanied St. Paul in his missionary journeys, and is described by him as his "companion" (2 Tim. iv. 11), his "fellow-worker" (Philem. 24), and the "beloved physician" (Col. iv. 14). The earliest authority which expressly ascribes the authorship of the third Gospel to St. Luke is the Muratorian Canon (*circa* 170). The statement of Irenæus that St. Luke committed to writing what St. Paul preached to the Gentiles, has been taken to mean that the real author was St. Paul; Eusebius mentions that some put this interpretation on the expression "my gospel" in Rom. xvi. 25, 2 Tim. ii. 8; others think that St. Luke was assisted by St. Paul in its composition. The Acts of the Apostles was accepted as the work of St. Luke by

Irenæus, Clement of Alexandria, Tertullian, Jerome, and the other Fathers by whom it is mentioned. Their testimony was never called in question till within a recent period. The similarity of the Gospel and Acts in language and style is strongly in favour of the ancient tradition. Even those who regard the book as a compilation suppose St. Luke to be the author who writes in the first person in Acts xvi. 10, and thus this passage affords a glimpse into his personal history. Jerome states that he lived to be over eighty, and died at Patræ in Achaia; but, according to Gregory Nazianzen, he suffered martyrdom.

Lully, LULLI, or LULLE, RAYMOND (1234-1315), "the Enlightened Doctor," was born at Palma, in Majorca, and became seneschal in the court of the king of Aragon. Believing that he had received a divine call, he resolved to devote his life to the conversion of the Mohammedans; and, after spending many years in the study of philosophy, theology, and Arabic, sailed to Tunis in 1291. To this period of preparation belongs the *Ars Magna* or *Generalis*, in which is set forth a kind of *memoria technica* regarding the method to be followed in the investigation of truth, based on the Aristotelian logic. His disputations at Tunis ended in his banishment after he had been thrown into prison and narrowly escaped execution. He returned to Africa in 1306, now visiting the city of Bugia, but experienced exactly the same fortune. During a second sojourn at Bugia the natives dragged him outside the city and stoned him. He was rescued by some Genoese merchants, but died on the homeward journey.

Lumbago. A painful affection of the muscles of the lumbar region. Its exciting cause is usually exposure to cold; the pain is often very distressing and especially aggravated by movements. Dry heat and friction are the most useful forms of local treatment. The skin over the affected muscles should be well rubbed with turpentine liniment, and warm cotton-wool then bandaged over the loins. The belladonna and chloroform liniment is also of use in some instances. The administration of salicylate of soda internally is advocated. Vapour baths are often beneficial.

Luminosity is produced when any body is sufficiently heated. A ball of iron will emit light if its temperature is about 1300° C., and it then looks white hot. The temperature required to make a gas luminous is extremely high, and flame (q.v.) is then produced. It often happens that a flame gives very little light—a spirit lamp is an example of this—but the introduction of something solid into the flame at once increases its luminosity. Except in a very few cases, solid particles of some kind must be present in order that a flame shall give light. The luminous part of a gas flame contains countless particles of solid unburnt carbon, but if air is supplied to the burner so that these particles are burnt up, the flame becomes almost invisible. The luminosity of a flame is increased if the temperature can be raised, when, for example, a substance is burnt in oxygen instead of air. It is

also increased if the surrounding atmosphere can be condensed. A spirit lamp has been found to give a bright light when burnt in compressed air.

Lumpsucker, any fish of the genus *Cyclopterus*, of the Acanthopterygian Family Discoboli (in which the ventral fins are modified to form a sucking disk). There are three species from the Arctic and north temperate zones. The body is short and thick, the head and the skin covered with tubercles. *C. lumpus*, the Common Lumpsucker, is abundant on the northern shores of Britain. Scottish fishermen call the male the Cock, and the female the Hen Paddle, from the fancied resemblance of the dorsal ridge to the comb of a cock. The coloration is brilliant, and the flesh, which differs in quality at different seasons, is eaten.

Lunacy. [INSANITY.]

Lunar Caustic consists of the nitrate of silver, AgNO_3 , melted and cast into sticks. It is employed as a caustery, acting powerfully on organic substances. If taken internally it attacks the mucous membrane, producing inflammation. In small doses, however, it may be used medicinally in stomachic and nervous affections. The name is a relic of the alchemistic time, when silver was represented by the sign of the crescent moon, and known by the name of Luna.

Lunar Observations, or the LUNAR METHOD, a way of observing the angular distance between the moon and the sun or a fixed star, and comparing it with the computed distance in the Nautical Ephemeris, for the purpose of ascertaining the longitude at sea. The method, a very ancient one, was readopted and perfected by Dr. Nevil Maskelyne when on a mission to observe the transit of Venus in 1761; and it was Dr. Maskelyne who first proposed and superintended the preparation of the *Nautical Almanac*, the tables in which relieve the calculator from all the more laborious part of the process.

Lunar Theory explains the moon's motions in the heavens by mathematical reasoning, founded on the law of gravitation. If the earth were the only body which attracted the moon the theory would be very simple, but the attractive force of the sun causes many irregularities in the moon's path. The sun's attraction on the moon varies with the position of earth and moon in the earth's orbit, and with the position of the moon in her own orbit, so that the moon is a little behind or in front of the place she would occupy, if her path were a true ellipse with the earth in one focus. This same attractive force causes the moon's orbit to slightly alter its inclination to the ecliptic—the average inclination being about 5° . The moon's orbit, as a whole, moves round the earth every nine years, and her nodes (q.v.) move backwards on the ecliptic about $19\frac{1}{2}^{\circ}$ every year. It will thus be seen that the sun's attractive force is alone sufficient to make the Lunar Theory extremely difficult and complex; but a further small inequality is due to the fact that the earth is not a perfect sphere. Venus also exerts a slight influence.

Lunatics. A lunatic is a person "who hath had understanding, but by disease, grief, or any other cause, hath lost the use of his reason or has become *non compos*," that is, of mind so unsound as to be incapable of conducting himself or his affairs, and this last term (according to Sir E. Coke) is the most legal—the term lunatic being in its derivation applicable only to one that has lucid intervals, depending, as some formerly imagined, upon the change of the moon, though now used technically as well as popularly in the more extended sense of a person affected by any species of insanity supervening since his birth. To all lunatics, as well as to idiots, the sovereign is guardian. The Lord Chancellor, to whom, by special authority from the sovereign, the custody of both idiots and lunatics is entrusted upon petition or information, grants a commission in the nature of the ancient writ *de lunatico inquirendo* to inquire into the party's state of mind. The proceedings on such commission are regulated by the Lunacy Act, 1890, which repeals, but in substance re-enacts, the three earlier Lunacy Acts of this reign, 16 & 17 Vict., c. 70; 25 & 26 Vict., c. 86; 45 & 46 Vict., c. 82. Under this Act the commission is directed to certain judicial officers known as Masters in Lunacy, but the inquiry into the state of mind of the party as authorised by such commission, usually takes place before a jury on an issue directed by the Lord Chancellor to be determined in that manner. The verdict on such inquisition must be upon the oath of twelve men at the least, and after the due examination (unless in special cases) of the alleged lunatic. And such examination may be either in open court or in private, as the judge trying the case shall direct. If, by the verdict of the jury, he be found *non compos*, the care of his person with a suitable allowance for his maintenance in some private or public asylum (where an asylum is requisite), is usually committed to some friend who is then called his *committee*. By the provisions of the successive Lunacy Acts of the present reign above referred to, every person found by inquisition to be lunatic is to be personally visited, seen, and reported upon by official *visitors*, four times at least every year, and at such other times as the Lord Chancellor may direct. Our Statute Law contains also a variety of other provisions for the protection and management of persons labouring under this calamity, but space will not admit of their further notice here.

Lund, two groups of Baluchi tribes: (1) Lunds of Lori, in the northern parts of the Dera Ghazi district, with 6 branches and 32 subdivisions. (2) Lunds of Tobi, in the Jampur district, N. of Harand, with 3 branches and 23 subdivisions.

Lund ("grove"), a city in the Swedish province of Gothland, 10 miles N.E. of Malmö. It was one of the most important towns in the mediæval kingdom of Denmark. There is a fine Romanesque cathedral, built in the 11th century. The university, founded in 1668, is attended by about 800 students; the buildings include a library of over 120,000 volumes, observatory, zoological museum, botanic garden, etc.

Lundy (Scandinavian "puffin island"), a rugged

and precipitous island at the mouth of the Bristol Channel, 11 miles N.N.W. of Hartland Point. It forms part of the county of Devon, and is about 3 miles long with an average breadth of 1 mile. There are only two or three places at which a landing can be effected. The cliffs are frequented by innumerable sea-birds. There are remains of an ancient stronghold, "Morisco Castle," and other antiquities. Near the southern extremity stands a lighthouse, with a revolving light 540 feet above the sea.

Lüneburg, a town of Hanover, situated on the Ilmenau, a tributary of the Elbe, 31 miles S.E. of Hamburg by railway. It was formerly the capital of the principality of Brunswick-Lüneburg, from the ruling family of which the sovereigns of Great Britain are descended. [BRUNSWICK.] In the narrow streets which form the central part of the town there are many picturesque old houses. The mediæval buildings include an interesting rathaus and the churches of St. John and St. Michael, dating respectively from the 14th and 15th centuries. There are salt and gypsum mines, iron-works, and linen, woollen, and cotton manufactures. To the S. of the town is the Lüneberg Heath, 50 miles in extent, the heather of which yields excellent honey. Sheep are also raised, and the peat furnishes a valuable supply of fuel.

Lungs. The two lungs lie within the cavity of the thorax, the heart being situated between them. During life the lungs are always more or less on the stretch, and the lung surface lies close beneath the chest wall, the lungs filling up the cavity of the thorax. The lungs are surrounded by a kind of bag or sac, composed of a serous membrane called the pleura, but this pleural sac is practically empty, the layer which covers the lung surface lying close to the outer layer, which is adherent to the chest wall.

The air in the lungs is, in fact, under pressure, the atmospheric pressure being transmitted from the mouth to the ultimate extremities of the air passages, by which the lung is permeated; there is thus a continual distending force acting upon the lung from within, and there is no counterbalancing pressure applied from without, for the lungs lie in the air-tight chest, shielded, as it were, from the pressure of the atmosphere outside, by the walls of the thorax. The lung is thus blown up, so to speak, by pressure from within, and, containing as it does a large amount of elastic tissue, it is distended and made to fill the thoracic cavity. If an opening is made in the chest wall of an animal after death, the lungs at once collapse, for the outer surface of the lung is now exposed to atmospheric pressure as well as the inner surface, and these pressures counterbalancing one another the stretched elastic tissues of the lungs are no longer maintained in a state of tension, but contract and produce a shrinking up of the lung. When the lung collapses, the two layers of the pleura part company, the layer covering the lung shrinking with the lung, and the outer layer remaining adherent to the chest wall.

It has been stated that the lung is permeated by air passages. The trachea (q.v.) is the main

channel of communication between all these air passages, on the one hand, and the larynx, mouth, and outer air, on the other.

The trachea divides into two tubes, the two *bronchi*, one for each lung; each bronchus subdivides, and each division of the bronchi again subdivides and so on. These subdivisions bring us at length to the minute tubes which are known as the *ultimate bronchioles*. Each of these bronchioles expands into a funnel-shaped sac, into which open a number of minute pouches. These pouches are the *air cells*, and the sac with its pouches is called an *infundibulum*. The lungs are divided into *lobes*—the right lung having three lobes, and the left lung two lobes. These lobes or divisions of the lungs are again divided into *lobules*, and each lobule may be regarded as made up of a number of the infundibula already alluded to.

The entire inner surface of the air passages of the lung is lined by a mucous membrane, covered internally with epithelium. External to the mucous membrane is a supporting framework containing elastic tissue, glandular tissue, and, in the case of the bronchi and trachea, cartilage. The epithelium of the larger air passages comprises several layers of cells, the innermost layer consisting of ciliated epithelial cells. In the smaller tubes, the epithelium and the outer supporting framework become attenuated, the number of layers of cells diminishes until only one layer is left, and finally in the infundibula and air cells this single layer of cells is no longer ciliated but consists of much-flattened epithelial cells. These ultimate air passages consist of nothing more than a delicate membrane which has elastic fibres coursing over it, is lined internally with flattened cells and supports the rich network of capillary blood-vessels distributed upon its outer aspect. The blood in the capillaries of the lung is thus spread out over a large aërating surface, for while each air cell is a minute microscopical object, the combined area of the surface of all the air cells is considerable, and there is, therefore, abundant opportunity for the interchange of gases between the blood and the air in the air cells.

Venous blood is conveyed from the right ventricle of the heart to the lungs by the pulmonary artery. It is there distributed throughout the capillaries, takes up oxygen and loses carbonic acid by exposure to the air contained in the air cells, and is returned by means of the pulmonary veins to the left auricle of the heart. [RESPIRATION.]

Diseases of the lung, *see* BRONCHITIS, CONSUMPTION, EMPHYSEMA, EMPYEMA, PLEURISY, PNEUMONIA.

Lupercalia, in the ancient Roman religion, was a festival held on the 15th of February in honour of Lupercus, a pastoral deity of primitive character. Goats and dogs were sacrificed, and the Luperci, or priests of Lupercus, then ran round the city walls, striking everyone they encountered with thongs formed from the skins of the victims. In the case of women these blows were supposed to prevent or cure sterility. Mark Antony (q.v.) was one of these priests.

Lupine (*Lupinus*), a genus of Leguminosæ,

belonging to the tribe Genisteæ. In the Mediterranean region it is represented by annual species; but in America, where they are more numerous, several of them are perennial woody under-shrubs. They have peltate, palmate leaves, a bi-labiate calyx, a pointed keel to the corolla, monadelphous stamens, and a flattened pod. *L. albus*, cultivated in ancient Egypt, is still grown in Italy for forage and for its seeds which, when boiled, are a valuable article of food. The long erect racemes of white, blue, purple, or yellow flowers make all the species ornamental garden plants.

Lupus, an affection of the skin, characterised by the development of an eruption of an erythematous or tubercular character with subsequent scarring, and, it may be, extensive destruction of skin tissue. It often occurs in association with enlargement of glands, particularly of the cervical glands, and with other affections of a scrofulous nature. The disease is not attended with much discomfort, but is very distressing on account of its unsightly appearance, and is, moreover, usually indicative of a bad state of health. *Lupus erythematosus* is the least severe form of the disease; it usually affects the face, its course is very protracted; it commences, as a rule, in adult life, and is more common in females than in males. *Lupus non exedens* particularly affects the nose and cheek; tubercles appear in the first instances, and are followed by changes in the skin tissue, resulting in the production of a greyish-white unsightly scar. In *lupus exedens* there is extensive destruction of tissue with distortion of the shape of the eyelids, nose, or mouth, according to the seat of the mischief. A bacillus closely resembling the bacillus of tubercle has been discovered in the tissues affected with lupus. Treatment comprises the administration of tonics and cod-liver oil, with change of air when possible. Locally, innumerable remedies have been tried, but the disease is eminently chronic and intractable.

Lurcher, a cross between the greyhound and collie, often with a strain of spaniel blood. The lurcher is the dog of the poacher and gipsy, and rivals, if he does not excel, the collie in intelligence.

Luri (LORI), a collective name of the gipsies of Baluchistan and Sindh, showing marked affinities to those of Europe, are chiefly tinkers, bards, strolling minstrels, cattle (camel) lifters, and kidnappers. Each band has a "king," and many are retainers of the powerful Baluchi families.

Lurs, a main branch of the Kurdish race, in west Persia, and especially in the province of Luristan, named from them. Four primary divisions: (1) *Amale* ("Workmen"), mostly in village settlements, with 30 sub-groups; (2) *Balagiriveh* ("Highlanders"), in the uplands between the Dizful and Kashgân rivers, with 8 sub-groups and endless minor divisions; (3) *Silsile*, with 4 sub-groups and over 40 minor divisions; (4) *Dilfan*, with 4 sub-groups and 14 minor divisions. The Dulfans are hated by all the others and called *Lek* or *Kurd*, in an opprobrious sense, although the Lurs themselves are originally Kurds, as shown by

their language, which differs but slightly from that of the Kirmanshah Kurds. The explanation seems to be that most of the Lur branch became Mohammedans at an early date, while the Kurds, Leks, and Dulfans remained heathens, hence were despised by the converts. In Luristan Schindler often heard bad Mohammedans called *Kurd* or *Lek*, and it is this use of these terms that has caused so much confusion in the ethnology of west Persia. All these semi-nomad wild tribes are called *Pish-i-Kuh* ("Before the Mountains") by the Persians, in reference to their position on the eastern slopes of the western ranges, facing the central plains. (A. H. Schindler, *Reisen*, etc., in *Zeitschrift für Erdkunde*, No. 80, 1879.)

Lusatia, a district of Germany, between the Elbe and the Oder, formerly consisted of two separate margraviates, Upper or Southern, and Lower or Northern Lusatia. They both belonged to Saxony from 1635 to 1815, when Lower Lusatia and part of Upper Lusatia were incorporated with Prussia.

Lusatians, a Wendish (Slav) people, who still survive in the Prussian and Saxon provinces of Upper and Lower Lausitz, where they are entirely surrounded by German-speaking populations. The village communities, still speaking the old Wendish language formerly current throughout the Elbe basin, number about 140,000 souls, but are gradually becoming absorbed by the dominant German element.

Lushai. [Dzo.]

Lustre, a somewhat complex character of minerals, not easy of definition, consisting in the quality and intensity of the light reflected from their surfaces. The *kind* or *quality* of lustre depends partly upon structure, partly upon transparency, and largely upon refractive power; the *degree* of lustre, upon the amount of reflection. Minerals with perfectly smooth faces are either metallic, adamantine, resinous, or vitreous. If opaque and with an index of refraction (q.v.) above 2.5, they are *metallic* (1), as in most native metals and their sulphides, such as galena and pyrites. If with an index between 2.5 and 1.9, they are *adamantine* (2), whether transparent, as diamond, or opaque, as blend. If translucent only, with an index between 1.9 and 1.7, they are *resinous* (3), as in garnet. An indefinable variation of this, resembling wax, seen in some opal and in hornsilver, is termed *waxy* (4). If transparent and with an index between 1.8 and 1.3, as in ice, fluor, quartz, rock-salt, calcite, and sapphire, the mineral is termed *vitreous* (5). Numerous lamellæ within a translucent mineral, whether well-developed cleavage-planes, as in mica and selenite, or the result of incipient decomposition, produce *pearly* (6) cleavage. Fibrous structure, such as that of asbestos and satin-spar, produces *silky* (7) lustre. In degree, lustre is either (1) *splendent*, where a well-defined image is reflected, as in specular hæmatite; (2) *shining*, where only ill-defined images can be reflected, as in celestine or baryte; (3) *glistening*, where there is a general surface

reflection but no recognisable image, as in mica; (4) *glimmering*, when there is only a faint reflection from scattered points on the surface, as in flint; or lastly (5) *dull*, when there is scarcely any white light reflected from the surface—a character mainly exemplified by ochres and other earthy minerals. Unlike faces of the same crystal often differ in lustre, pearly and silky lustre especially being commonly confined to particular faces, those parallel to the cleavage.

Lute (Arabic, "the wood"), a stringed musical instrument of the guitar class, introduced into Europe by the Arabs soon after their conquest of Spain. It was very popular during the Middle Ages and up to the close of the 17th century, but, except in the East, now exists only in the form of the guitar, banjo, and similar instruments. When it had reached its full development the lute usually consisted of the following parts: a back, which was usually rounded or pear-shaped; a belly with a large sound-hole in the centre or sometimes several sound-holes; the neck with frets formed by fastening strings of catgut tightly round it in such a manner as to produce semi-tones; the head or cross on which were the pegs or screws for tuning the strings; and the bridge to which the lower ends of the strings were fixed. The strings, the number of which was gradually increased from eight to twenty-four, were made of catgut and were arranged in pairs of unisons, half the number passing over the finger-board and the other half lying beside it. Lutes were generally ornamented with ivory, tortoiseshell, and mother-of-pearl.

Luther, MARTIN (1483–1546), was the eldest son of Hans Luther, a miner, and was born at Eisleben, in Saxony. When he was six months old his parents removed to Mansfeld, where he attended the Latin school. After spending a year in the Franciscan school at Magdeburg, he was sent at the age of fifteen to Eisenach. During this period his means were so scanty that he was forced to sing for bread in the streets, till the beauty of his voice attracted the notice of Ursula Cotta, wife of the burgomaster of Eisenach, who received him into her household. In 1501 he entered the university of Erfurt, where he studied philosophy and the classics with the view of becoming a lawyer, taking his Master's degree in 1505. Meanwhile several circumstances—chief among which was the sudden death of a friend—had given his thoughts a religious bent. He now withdrew to the Augustinian monastery at Erfurt. Here he passed through a season of religious despondency, but his peace of mind was gradually restored, mainly through the intelligent and kindly sympathy of the Vicar-General, Staupitz. The fundamental doctrines of the Lutheran creed, which were now gradually taking shape, were, in large measure, due to the influence of Staupitz as well as Luther's own study of the Bible and the works of St. Augustine. In 1508 Luther was appointed professor of Philosophy at Wittenberg, where his public sermons, as well as his Biblical lectures to students, attracted many adherents. A visit to Rome in 1511 produced in his mind a deep impression of the corruption of the

Church, and certainly hastened on his revolt from her authority. He felt constrained to take a bold course when, in 1517, John Tetzel, a Dominican friar, arrived in Saxony with a commission from Leo X. authorising him to sell indulgences. When Tetzel had reached Jüterborg, near Wittenberg, there appeared on the door of the Castle church in the latter town a document containing ninety-five propositions against the practice. This determined step excited the greatest enthusiasm, and Tetzel was compelled to leave the electorate. But there was no lack of adherents to the Papal cause, and Luther was soon drawn into several controversies, the most noteworthy being that with his old friend and fellow-student, John Eck, of Ingolstadt. As Luther remained obstinate, he was summoned to Rome, but the Elector of Saxony interfered, and finally it was arranged that the case should be tried by the Legate Cajetan at Augsburg. Cajetan's bias soon became evident, and Luther thought it prudent to leave the town. The Pope now assumed a more conciliatory attitude, but Luther continued to preach, argue, and write against the abuses of the Church, and in 1520 Leo issued a bull against him containing forty-one theses. This bull Luther publicly burnt outside the gates of Wittenberg, and was in consequence summoned before the Emperor Charles V. and the German Diet at Worms (1521). He refused to retract, and was not allowed to support his cause by argument; but no attempt was made to detain him by force. He was, however, put under the ban of the Empire, and the Elector of Saxony, fearful for his safety, caused him to be seized by a band of armed knights, as he was journeying homewards through the Thuringian forest, and conveyed to the Castle of Wartburg. In this solitude he began his translation of the New Testament, which was completed and published in 1522. The disturbances caused by Carlstadt and his associates recalled him to Wittenberg (March, 1522), where he earnestly strove to calm the excited peasantry, at the same time remonstrating with the nobles on their tyrannical conduct. In 1524 he renounced his monastic vows, and in 1525 married Catherine von Bora, who had been a nun. In the same year occurred his unfortunate controversy with Erasmus regarding the freedom of the will. In 1529, in a conference held at Marburg, he engaged in a bitter dispute with Zwingli concerning the Lord's Supper (q.v.). Luther took no part in drawing up the Protestant document called the "Confession of Augsburg" (1530), which was solely the work of Melancthon. His closing years were embittered by domestic sorrows and dissatisfaction with the religious and social condition of Germany. He died at Eisleben, and was buried at Wittenberg. Of all his numerous works, which include various hymns, sermons, and commentaries, none, with the exception of his translation of the Bible, has exercised more influence than the *Table Talk*, which is everywhere marked by the same rude vigour, homeliness, and religious fervour.

Lutheran Church, THE, was founded by the followers of Martin Luther (q.v.), whose tenets

differed in many points from those of the Reformed Church (q.v.) or Calvinists. The whole body of Lutheran doctrine is based on nine creeds or confessions—the Apostles', Nicene, and Athanasian Creeds; and six documents of the 16th century, viz. the Augsburg Confession (q.v.), the Apology for the Augsburg Confession, the Smalkald Articles, Luther's two Catechisms, and the Form of Concord. Only the three creeds and the Augsburg Confession are accepted by all Lutherans; the shorter catechism, however, is almost universally recognised. Lutheran theology as a whole may be said to be summed up in the doctrine of justification by faith. The main cause of the discussion between the "Evangelical" and "Reformed" Churches has been the difference in their views regarding the nature of the Lord's Supper (q.v.). Owing mainly to the excessive anxiety of its members to preserve the reformer's teaching free from corruption or change, as well as the depressing influence of the Thirty Years' War, there grew up in the Lutheran Church a spirit of narrow orthodoxy which opposed as innovations all efforts after a deeper religious life. This was especially noticeable in the case of Pietism (q.v.). At a later date Rationalism (q.v.) thrived apace amidst the prevailing formality and listlessness, and gained a footing within the Church itself which it never afterwards lost. The efforts made by Friedrich Wilhelm III., after the close of the Napoleonic War, to effect a reconciliation between the Lutheran and Reformed Churches, and found a "United Evangelical Church," met with partial success—at least as far as Prussia was concerned—although a large number of the former body seceded under the name of "Old Lutherans." The views of the "New Lutherans," who aim at promoting a more liberal spirit in regard to dogma, were first promulgated about 1848. Lutheranism is the national religion of Sweden, Norway, and Denmark, and there is also a Lutheran Church in many other lands. In Germany the Church is under the general superintendence of the Cultus Minister in Berlin, but each state has its own clerical council, presided over by the civil ruler. The superintendents, as the chief ecclesiastics are called, alone have the power of ordaining the clergy. The services retain many features discarded by other Protestant bodies, *e.g.* crucifixes, candles, the sign of the cross, in accordance with Luther's principle that everything should be preserved which is not incompatible with purity of worship.

Lu-tze, aborigines of south-west China in the mountains on both sides of the Lu-tze-kiang (Upper Salwen), N. of the Lissu domain. The national name is *Anong*, pronounced *Nu* in Pekin, and *Lu* in Sechuen, whence the form *Lu-tze* by the addition of the usual meaningless syllable *tze*. Their chief town is Cha-mu-tong, and they reach thence north to the Tibetan province of Tsarong; are of the same stock as the Mosso and Lissu, consequently of Caucasian rather than Mongolic type. But, unlike the neighbouring Lissu, they are a gentle, peaceful people, never raiding on the settled populations, and scarcely ever leaving their mountain homes except to pay the annual tribute,

which is exacted both by the Chinese and the Tibetan authorities. Although still addicted to the chase, they also till the land in a primitive way, raising crops of maize, millet, or rice in sufficient quantities to supply their own wants and to barter with the Tibetans for salt and woollen garments. All are fetishists, peopling the forests, rocks, and streams with evil spirits, authors of all their misfortunes. The language is very soft, but supplies no terms for the year, months, or days, so that these rude tribes are unable to keep any chronological record of events. (Lepper, *Notes on the Singpho and Khamti Country*, in *Proceedings of the Asiatic Society of Bengal*, 1882, p. 64.)

Luxembourg, FRANÇOIS HENRI DE MONTMORENCI-BOUTTEVILLE, DUC DE (1628-95), a famous French general, was the posthumous son of the Comte de Montmorency-Boutteville. He served under Condé in the Spanish army (1653-59), and again in the invasion of Franche-Comté (1667-68). In 1672 he was placed in command of the army which invaded Holland, and by his masterly retreat from Utrecht (1673) established his reputation as a general of the first rank. In 1675 he was created a marshal of France. After 12 years of neglect he received the command of the army of Flanders, and gained a series of brilliant victories, defeating the Prince of Waldeck at Fleurus (1690), and William III. at Steenkerk (1692) and Neerwinden (1693).

Luxemburg (Germ. "Lützelburg"), an ancient hereditary possession of the House of Orange, now comprises (1) a grand-duchy ruled by the king of the Netherlands, (2) a province in the kingdom of Belgium. After the fall of Napoleon the Congress of Vienna made it an independent member of the German Confederation, under the sovereignty of the king of Holland (1815). Luxembourg joined itself to Belgium on the formation of that kingdom in 1830, but by the Treaty of London (1839) that part which now forms the grand-duchy was restored to Holland. On the dissolution of the German Confederation the connection with Germany ceased, and the Prussian troops were withdrawn. (1) The grand-duchy is bounded by the Belgian province on the W. and N.W., by Rhenish Prussia on the E. and N.E., and by France on the S. The area is 998 square miles. It belongs mainly to the table-land of the Ardennes; the surface consists chiefly of moors and swamps, alternating with wide tracts of forest. It is drained by the Moselle, which skirts the S.E. border. The chief industry is the rearing of live stock. There is an abundance of iron ore, which, together with timber, forms the chief export. The inhabitants are Low German in race and speech, and profess the Roman Catholic religion. French, however, is the official language, and is spoken in the upper ranks of society. The government is carried on by a House of Representatives containing 42 members, 21 of whom retire every three years. The capital, LUXEMBURG, 32 miles S.W. of Trèves, is partly situated on the summit of a precipitous rock, 200 feet in height, and partly on the plain below it. It was formerly considered almost

impregnable, but was dismantled under the Treaty of London in 1867. There are manufactures of leather, gloves, and linen. (2) The products, industries, and general characteristics of the Belgian province are very much the same as those of the grand-duchy. The area is 1,706 square miles.

Lycænidæ, a family of small butterflies in which the front legs in the male are only slightly imperfect. The three best-known groups included in this family are the Coppers (q.v.), Blues (q.v.), and Hairstreaks (q.v.). The larvæ often exude a liquid of which ants are fond. To obtain it the eggs are collected by ants, and the larvæ reared in the ant-hills.

Lycanthropy. [WEREWOLF.]

Lycia, in classical geography, was a mountainous district on the S. coast of Asia Minor between Caria and Pamphylia. It is semicircular in form, the landward side forming the chord of the arc. The original inhabitants, the Solymi (or Milyæ), are described in the *Iliad* as a brave and warlike race, and, according to the same authority, the chieftains who led them were of Æolid extraction. Lycia is supposed to have been colonised by Hellenes from Crete. The Lycians maintained a successful resistance against Croesus, and were the last people in Asia Minor to submit to the Persians. The county is rich in architectural remains.

Lycurgus (b. *circa* 820 B.C.), the Spartan law-giver, according to tradition was the son of Eunomos, King of Sparta, acted as guardian for his nephew Charilaus, journeyed abroad to study the laws of other countries, and on his return issued his code, which sought to subordinate private interests to those of the commonwealth. [SPARTA.]

Lydgate, JOHN (*circa* 1370-1451), poet, was born at Lydgate near Newmarket, and became a monk in the Benedictine Abbey of Bury St. Edmund's. He was patronised by the first two Lancastrian kings, and during the reign of Henry VI. seems to have occupied a position corresponding pretty closely with that of the poets-laureate of a later age. He wrote on a variety of themes, usually suggested by the circumstance of the time or the demands of his patrons. His chief efforts were three narrative poems entitled the *Falls of Princes*, the *Troy Book*, and the *Story of Thebes* (from Boccaccio), the two former of which extend to a prodigious length. Lydgate's works are tedious in the extreme, and utterly devoid of artistic sensibility or imaginative power. His satirical poem, *London Lackpenny*, is more lively than most of his productions, and throws much light on the manners of the age.

Lydia, in classical geography, was a district of Asia Minor, bounded by the Ægean on the W., Mysia on the N., Phrygia on the E., and Caria on the S. The ancient civilisation of Lydia, which bears some traces of a Hittite origin, exercised a powerful influence on the Ionic colonists who settled along the coast, and through them on the general development of Greek religion and culture. The third dynasty of Lydian kings, founded by Gyges (q.v.), ruled at Sardis from the beginning of the 7th to the middle of the 6th century B.C.; the last

and most powerful monarch of this line was Cræsus (q.v.), who extended his dominions as far as the Halys on the E., and overcame the Greek colonies on the W., but was eventually overthrown by the Persians. Lydia was afterwards conquered by the Macedonians, formed part of the kingdoms of Syria and Pergamus successively, and eventually passed to the Romans.

Lyell, SIR CHARLES, BART. (1797–1875), a celebrated English geologist, was born in Forfarshire and educated at Oxford, where he obtained a second class in classics. He was called to the bar in 1825, but whilst a student at Lincoln's Inn he had become the pupil and friend of Dr. Buckland, through whose influence his mind was powerfully drawn to geology, and in 1827 he abandoned the legal profession. After travelling on the Continent and contributing papers to the *Transactions* of the Geological Society, he published his *Principles of Geology*, which established the science on an entirely new basis. For the old notion of cataclysms and catastrophes were substituted the Huttonian doctrines, according to which the various changes in the earth's surface and in the rocks composing its coast have been caused by physical agencies identical with those now in operation; in this way geology became a branch of inductive science. Lyell was president of the Geological Society in 1836, and again in 1850. He visited America in 1841 and 1845, and published narratives of both expeditions written in a popular style. He was one of the earliest adherents of the Darwinian theory, which he defended and expounded in *The Antiquity of Man* (1863).

Lyly, or LILLY, JOHN (1553–1606), novelist and dramatist, was born in Kent and educated at Magdalen College, Oxford. After leaving the university he attached himself to Lord Burghley, from whom he does not seem to have received much encouragement. The first part of his famous novel, *Euphues, or the Anatomy of Wit*, was published in 1579; *Euphues and his England* followed in 1580. He describes the travels, gallantries, and studies of a youth named Euphues, who in the first part visits Naples and Athens, and in the second journeys to England with his friend Philautus. The book abounds in moral dissertations, classical allusions, and descriptions of life and manners, such as the age loved; but its popularity was mainly due to its peculiarities of style, which were much admired by Elizabeth's courtiers, and gave rise to the manner of speaking and writing called "Euphuism." Its characteristics have been described by Dr. Lachmann in his *Euphuismus* (1881) as "a combination of antithesis with alliteration, assonance, rhyme, and play upon words, a love for the conformity and correspondence of parallel sentences, and a tendency to accumulate rhetorical figures." Lyly's comedies mark a step forward in the development of the English drama. He is supposed to have died in poverty and neglect in the early part of the 17th century.

Lymph is the clear, slightly alkaline fluid which circulates in the lymphatic vessels. It coagulates on removal from the body and contains corpuscles,

the lymph corpuscles which resemble the white corpuscles of the blood. It differs from the chyle (q.v.) in containing no fatty particles. The system of *lymphatics* originates in a capillary network which is present in the various parts of the body. From this network the lymph is passed on into collecting lymphatic vessels which convey it to lymphatic glands; the lymph passes through these glands and is collected by main lymphatic trunks which finally convey it into the blood stream. The main trunk, into which the lymph of the lower limbs, left arm, and left side of the trunk, is conveyed, is called the *thoracic duct*. This duct runs upwards in front of the vertebral column and empties itself into the blood stream at the point of junction of the subclavian and internal jugular veins on the left side of the body. The lymph from parts of the body not already enumerated is conveyed by a second main trunk, which empties itself into the blood stream at the point of junction of the right subclavian and right internal jugular veins. The lymph consists of material exuded from the capillaries of the blood less such substances as are abstracted therefrom by the tissues, and plus the waste products cast off by the various tissues in the course of their growth and activity. The lymph undergoes certain changes in its passage through the lymphatic glands. Their nature is ill understood; but one change may be alluded to, namely, that the lymph becomes a readily coagulable fluid, the property of coagulation not being possessed, as a rule, by the lymph prior to its passage through a lymph gland. The circulation of the lymph is maintained in some animals—*e.g.* the frog—by contractile lymph hearts; in man, the circulation is largely dependent upon the valves which exist in the lymph vessels and which only permit of movement of the lymph in an onward direction. Muscular contraction, the movements of respiration, etc., in this way all take effect upon the lymph contained in the lymphatics in one direction (that of the lymph circulation), movement in the reverse direction being prevented by the valves.

Lymphatic Glands. [LYMPH.]

Lynch Law (whence the verb *to lynch*), the summary execution of persons obnoxious to society or to certain private individuals without any legal procedure. The term is said to be derived from a Virginia planter named Charles Lynch (1736–96) who in the early years of the American Revolution was in the habit of suspending the friends of the English Government by their thumbs till they cried "Liberty for ever." Although repugnant to dwellers in lands which have long been civilised, "lynching" may sometimes produce salutary effects in newly-settled communities where the administration of justice is as yet inadequate. But, whatever merits may be claimed for it, it has certainly been carried to an extreme in the southern and western states of America.

Lyndhurst, JOHN SINGLETON COPLEY, BARON (1772–1863), English statesman, was the son of the painter John Singleton Copley. He was born at Boston, Massachusetts, but when he was three years old his parents removed to England. He received his

education at Chiswick and the university of Cambridge, and was called to the bar in 1804. At first he was not very successful, but his abilities gradually attracted notice, and after his acceptance of a Government seat in the House (1818) his progress became rapid. The sincerity of his political views at this time has been doubted, but henceforward, at any rate, he showed himself a consistent and even bigoted Tory. He became Solicitor-General in 1819, Attorney-General in 1824, and Master of the Rolls in 1826, and was Lord Chancellor under Canning, Goderich, and Wellington (1827-30), and Chief Baron of the Exchequer and leader of the Opposition from 1830 to 1834. His opposition to all the measures of the Government during the great epoch of reform (1835-41) was very acceptable to one section of his party, who proposed him as leader in place of Peel. He was again Chancellor from 1841 to 1846, when he ceased to take an active part in public life.

Lyndsay, or LINDSAY, SIR DAVID (*circa* 1490-1555), Scotch poet, is supposed to have studied at St. Salvator's College, St. Andrew's. He was "usher" to James V. from 1512 to 1524, when the influence of the queen-mother and the Douglas faction occasioned his withdrawal from Court. He was afterwards sent on embassies to the Netherlands (1531), France (1536), and other countries, but probably spent most of his time at his country seats, the Mount, near Cupar, and Garmylton or Garleton, in East Lothian. His chief poems were *The Dreme* (1528), describing in the form of a vision the anarchy and misery which prevailed in Scotland, and *The Satyre of the Thrie Estaitis* (1535), in which the vices of all classes of society are unsparingly attacked. These works are characterised by humour, shrewdness, and much knowledge of the world. They contributed greatly to bring about the Reformation in Scotland, and maintained their popularity in that country for over 200 years.

Lynedoch, THOMAS GRAHAM, LORD (1748-1843), British general, was born in Perthshire. During the Peninsular War he was at first second-in-command under Sir John Moore (1808-9). Subsequently he won the victory of Barossa (1811), took St. Sebastian, and, after crossing the Bidassoa, led the British army into French territory.

Lynn, KING'S LYNN, or LYNN REGIS, a parliamentary and municipal borough and seaport in Norfolk, on the right bank of the Ouse, about two miles above the Wash and 48 miles W.N.W. of Norwich. Prior to the Reformation, when it passed into the hands of the Crown, it was the property of the Church and was called Bishop's Lynn or Lynn Episcopi. On the land side there are remains of ramparts and a fosse, and the town contains several timber-built houses, enriched with carvings. The buildings include a fine church ranging in style from Norman to Perpendicular, a Guildhall, a custom-house (1683), and a grammar school which existed in the reign of Henry VIII. Lynn received its first charter from King John in 1205. During the Middle Ages it was one of the

chief ports in the kingdom, and, though it long since lost this position, it still carries on an extensive shipping trade, mainly in corn, coal, timber, and the produce of the fisheries, which consists chiefly of shrimps, shell-fish, and smelts. There are two large docks, constructed between 1869 and 1884. Many of the inhabitants are employed in ship-building, iron-founding, malting and brewing.

Lynx, any individual of a group of the smaller Felidæ, from the northern and temperate regions of both hemispheres, distinguished by a short tail, tufted ears, long limbs, especially behind, and long soft fur, for the sake of which they are hunted. They frequent wooded and rocky places, and feed on sheep, lambs, and poultry. The European Lynx (*Felis lynx*), which ranges into Asia, is about three feet long, rufous grey above with spots of darker shade, and whitish beneath. It runs into several races or varieties, and is probably not distinct from the American form. The Tibet Lynx (*F. isabellina*) is pale yellow.

Lyons (Fr. *Lyon*), the second city of France, is situated in the department of the Rhone, 314 miles S.S.E. of Paris by railway and 218 N. by W. of Marseilles. The town is mainly built on a long narrow tongue of land formed by the Rhone and the Saône, which run almost parallel from the N. for some distance before they meet. Owing to the confined area, the houses are generally high and the streets narrow, giving the town a gloomy appearance, but improvements have taken place in this respect of late years. On the opposite banks of the two rivers there are several handsome suburbs, connected with the central peninsula by over twenty fine bridges. On the latter are situated most of the chief buildings, including the Palais des Arts, or museum; a library containing over 120,000 volumes, besides MSS. and art collections; the town-hall, built 1646 and restored 1702; the Hôtel Dieu, said to have been founded early in the 6th century; the lycée, hôtel de ville, arsenal, etc. Here are also the mediæval churches of St. Martin d'Ainay and St. Nizier. On the west bank of the Saône is the important suburb of Fourvières (the Roman *Forum Vetus*) situated on the slope of a hill which rises to a height of 410 feet and commands beautiful and extensive views, Mont Blanc being visible when the atmosphere is clear. This quarter contains the cathedral-church of St. John, the Palais de Justice, the archbishop's palace, the church of Notre-Dame, and that of St. Irenée, in the crypt beneath which is a vast collection of bones, said to be those of the martyrs who perished in the persecution under Severus. The name *Lyon* is derived from *Lugdunum*, the Latin form of the Gaulish name, which was adopted by a band of Greek refugees who settled here in 590 B.C. The Roman colony was founded in 53 B.C. Perhaps the most notable event in the long history of the town is the fearful havoc wrought by Collot d'Herbois and his associates in consequence of the resistance offered by the inhabitants to the decrees of the Convention. It has long been celebrated for its silk manufactures, which were introduced from Italy in the 15th century. Although the factory system exists

to some extent, this industry is for the most part carried on by workmen living in their own houses and assisted by journeymen and apprentices; the number of power-looms is about 20,000, of hand-looms nearly 85,000; the population of the northern suburb of La Croix Rousse is composed almost entirely of silk-weavers. The other manufactures include chemicals, hats, paper, machinery, and gold and silver ornaments. Besides importing raw silk and exporting silk fabrics, Lyons carries on a large general trade, owing to its central position.

Lyons, SIR EDMUND LYONS, FIRST LORD, naval officer, was born in 1790, and was made a lieutenant in 1801. He distinguished himself at the capture of Banda Neira in 1810, and at the storming of Marrack in 1811, and was made a commander in 1812, and a captain in 1814. In 1835 he was knighted and made minister-plenipotentiary to Greece, and he was created a baronet in 1840 and a G.C.B. in 1844. He became a rear-admiral in 1850; and in 1854-56 was commander-in-chief in the Mediterranean with temporary rank as admiral. For his services during the Russian War he was created a peer in 1856. Promotion to vice-admiral's rank followed in 1857, but Lord Lyons died in 1858.

Lyre, the chief musical instrument of the ancient Greeks. It belonged to the harp class, and was very much like the cithara. The body, which was hollow and rested on the lap whilst the instrument was played, commonly consisted of a tortoise-shell covered with bull's-hide; above it rose two horns, united at their upper extremities by a wooden cross-piece, from which the strings descended, their lower ends being attached to a bridge on the body. The strings were usually seven in number. The lyre was introduced into Greece from Egypt, but its original home appears to have been Palestine.

Lyre-Bird, any of the three species of Australian passerine genus *Menura*. These birds, rather smaller than a hen pheasant, are found in the brush of New South Wales, ranging north into Queensland and south into Victoria. The general plumage is sooty brown, the tail in the males of *M. superba* and *M. Victoria* is of sixteen feathers, the two outer curve like the sides of a lyre, the two long middle ones have vanes only on one side, and in the remaining twelve the barbs are widely separated. In *M. alberti*, the most northern form, the tail is not lyre-shaped, and the two outer feathers are shorter than the rest.

Lysander (d. 395 B.C.), a distinguished Spartan general and diplomatist, who, with the aid of the Persians, succeeded in finally overthrowing the naval supremacy of the Athenians. His first success was the defeat of the Athenian fleet at Notium in 407 B.C. By his victory at Ægos Potami in 405 he brought the Peloponnesian War to a close. This blow was followed by the capture of Athens (404), where he set up the Thirty Tyrants. He lost much of his power after the accession of the Spartan king, Agesilaus (397), and was endeavouring to effect a change in the constitution, by which the monarchy would have become elective, when he was slain in the battle of Haliartus.

Lysias (458-378 B.C.), an Attic orator, was born at Athens, his father being a Syracusan settler named Cephalus. In 443 he accompanied a party of Athenian colonists to Thurii in south Italy. Thirty years later he was expelled by the Spartan faction, and returned to Athens (411). He escaped death at the hands of the Thirty Tyrants by fleeing to Megara (404), and was one of the patriotic band who aided Thrasybulus in driving them out. The remainder of his life was passed at Athens, where he occupied himself with composing speeches for delivery in the law-courts. Thirty-five orations have come down to us under his name, but the authenticity of some of these is doubtful. His style is at once lively and graceful, and his language is exceedingly pure.

Lyttelton, GEORGE, LORD (1709-73), entered Parliament in 1730, became Chancellor of the Exchequer in 1755, and was raised to the peerage in 1757. His works include *Observations on the Conversion of St. Paul* (1747), *Dialogues of the Dead* (1760), a *History of Henry II.* (1764), and various poems.

Lytton, EDWARD LYTTON BULWER-LYTTON, LORD (1803-73), man of letters and politician, was the youngest son of General Earle Bulwer of Heydon Hall, Norfolk, and Elizabeth Barbara, daughter of Richard Lytton, of Knebworth, Hertfordshire. He was born in London and educated at Cambridge, where he won the Chancellor's Medal. His public career began with his entry into Parliament as member for St. Ives (1831), a seat which he soon exchanged for Lincoln (1832-41). He supported the Whigs on most questions, and in 1838 earned a baronetcy by his brilliant pamphlet called *A Letter on the Crisis*. He was Conservative member for Hertfordshire from 1852 to 1866, when he was raised to the peerage. Whilst Secretary for the Colonies under Lord Derby (1858-59) he formed the colony of British Columbia and separated Queensland from New South Wales. Lytton's chief characteristic, as an author, was his extraordinary versatility. He acquired more or less distinction as a novelist, poet, essayist, playwright and satirist, without attaining a position of the highest eminence in any branch of literature. It is on his novels that his reputation chiefly rests. They cover a wide field, from studies of the ancient world like *The Last Days of Pompeii* and romances on mediæval subjects such as *The Last of the Barons*, to tales of mystery of the type of *Zanoni*, and the numerous novels which deal with modern, especially fashionable, life. He is seen at his best in his historical novels. His satire *The New Timon* (1845) contains some graphic portraits of contemporary statesmen and a fierce attack, which did not remain unpunished, on Tennyson. His most successful plays were the *Lady of Lyons* and *Richelieu* (1838). He died at Torquay.

Lytton, EDWARD ROBERT, EARL OF (1831-92), son of the novelist, was educated at Harrow, and entered the diplomatic service in 1849. After holding the post of secretary of legation at various

European capitals, including Vienna (1869-72) and Paris (1872-74), he was appointed minister to Lisbon in 1874. He was Viceroy of India from 1876 to 1880, and in 1887 was sent as ambassador to Paris. His chief literary productions, published under the pseudonym of "Owen Meredith," were *Lucile, a Poem* (1860), *The Ring of Amasis*, a prose romance (1863), *Orral*, a poem (1869), and *Glen-areril*, a poem (1885). He also wrote a life of his father.

M.

M, the 13th letter of the alphabet, was developed by the Phoenicians from the hieroglyphic symbol representing an owl. M is the labial nasal, related to *b* and *p* as *n* is to *d* and *t*. It frequently interchanges with *n*; *cf.* *tempt* from Latin *tentare* with *count* from Latin *comitem*. It may also become *b*, as in *marble* from Low Latin *marmorem*. It has disappeared in some words, as in *five* (Gothic *fimf*.)

Mab, an important personage in the realm of faëry, some of whose functions are enumerated in *Romeo and Juliet* (i. 4). The Queen Mab of sixteenth- and seventeenth-century literature differs widely from Shelley's Queen Mab.

Maba, the dominant people in the kingdom of Waday, Central Sudan, whose territory lies in the north and north-east; there are over twenty tribal divisions, including the royal and noble Kodoy, Uled Jemma, Malanga, Madala, and Matlamba tribes, all united by their common Negro speech, history, traditions, and physical appearance. They are a rude, Negroid people, evidently crossed with Arab blood, and the reigning family even claims descent through the female line from a branch of the Arab dynasty of the Abbasides. Nearly all have long been Mohammedans, and whatever culture they possess is entirely due to Arab influences. From the great preponderance of this nation Waday is sometimes called Dar-Maba, "Mabaland." (Nachtigal, *Sahra und Sudan*, ii.)

Mabiha (MAVIA), a people of East Central Africa, who occupy the lower course of the Rovuma, but are cut off from the coast by the intervening Makuas and Matambwes. They are scattered over their rugged plateaus, not in villages, but in family groups of one or two huts. Both sexes wear the *pelele*, a wooden disk or ring two inches in diameter, inserted in the upper lip, to which it gives the form of a duck's bill. In other respects the Mabiha greatly resemble the neighbouring Makondes, to whom Consul O'Neill affiliates them. (*Proceedings of the Royal Geographical Society*, 1883.)

Mabillon, JOHN (1632-1707), a French writer on ecclesiastical biography, antiquities, etc., and on diplomacy, was born in Champagne, studied at the abbey of Saint Remy, became a Benedictine monk in 1654, and was ordained priest in 1660. After helping to edit St. Bernard's works, he began to write the *Acta Sanctorum Ordinis S. Benedicti*, in nine volumes (1668-1702), followed up (1701-7)

by four volumes of *Annales Ordinis S. Benedicti*. In 1681 he produced his treatise *De Re Diplomatica, Lib. VI.*, after which King Louis XIV. commissioned him to collect, in Italy, books and MSS. for the royal library. Mabillon lived many years and died at St. Germain des Prés.

Mably, GABRIEL BONNOT DE (1709-85), a distinguished French writer on politics and history, was born at Grenoble, and educated by the Jesuits at Lyons, but early abandoned theology for ancient history. Upon the issue of his *Parallèle des Romains et des Français* (1740) the Abbé Mably entered the service of Cardinal de Tencin, and in 1743 concluded a secret treaty with Prussia, while in 1746 he prepared the instructions of the French representative at the Congress of Breda. Mably soon after this quarrelled with his patron, and, retiring into private life, again occupied himself with history, his most valuable work being *Observations sur l'Histoire de France*.

Mabuse, or MAUBEUGE, JEAN DE, or JAN GOSSART (1480?-1562), a distinguished Flemish artist, born at Maubeuge, a village of Hainault, appears to have studied on the French border. He then went to Antwerp, and in 1508 went to Italy with his patron, Philip of Burgundy, where he studied the Leonardesque school. He introduced a new style into the Flemish school. He resided chiefly at Middleburg, where fine specimens of his art are preserved. He executed commissions for Charles V. and for Christian II. of Denmark, the portraits of whose children came into the possession of Henry VIII., and are now at Hampton Court. He is said to have visited England.

Macadam, JOHN LOUDON (1756-1836), inventor of the method of paving roads with layers of small pieces of hard stone, was born at Ayr, and, having lost his father, went at the age of fourteen years to an uncle in New York. During the American War of Independence he made a fortune, but at the end of the war returned to Scotland almost destitute. In 1728 he undertook to victual the navy in the western ports of England, and resided first at Falmouth and then at Bristol, where in 1815 he was appointed surveyor of roads and put in practice his scheme for improved road-making. The House of Commons eventually repaid his outlay, and gave him an honorarium of £2,000 for his invention. He died at Moffat.

Macaque, any monkey of the genus *Macacus*, with numerous species from India, Ceylon, and south-eastern Asia; one from Europe [BARBARY APE]; one, the Tcheli Monkey (*M. tcheliensis*), with thick woolly fur from Manchuria; and one, the Japanese Ape (*M. speciosus*), from Japan, the most northerly habitat of any living monkey. The last two specimens are exhibited in cages outside the monkey house in the Zoological Gardens, Regent's Park.

Macaroni, a dandy, originally a member of the Macaroni Club established in London about the middle of the 18th century. Its founders had travelled in Italy, and introduced Italian macaroni

into England; hence their name. They wore long curls and "spying-glasses," and were much given to drinking, gambling, and other fashionable vices. The Italian macaroni is wheaten paste, forced by great pressure into a pipe-like form.

Macartney, GEORGE, EARL (1737–1806), born in Ireland, and educated at Trinity College, Dublin, studied law at the Temple. He was appointed envoy-extraordinary to Russia in 1764, and then became secretary to the Lord-Lieutenant of Ireland and K.C.B. Being appointed governor of the Caribbean Isles, Grenada, etc., on the capture of Grenada by the French he was sent as a prisoner to France. On his release he was made an Irish peer and governor of Madras. In 1792 he conducted our first embassy to China with distinguished tact and success. He gained his British earldom after a confidential mission to Italy in 1796, and in the same year became governor of the Cape of Good Hope, but retired from ill-health in 1798.

Macassar Oil, a vegetable oil obtained from Macassar, has a grey colour and peculiar odour. The hair-oil so called consists of a mixture of oils, chiefly olive oil, coloured and perfumed.

Macaulay, THOMAS BABINGTON, LORD (1800–59), politician, essayist, and historian, born at Rothley Temple, Leicestershire, was son of ZACHARY MACAULAY, a prominent member of the "Clapham Sect" (q.v.), who was governor of Sierra Leone from 1792–9. His son Thomas spent his early years at Clapham, and in 1818 entered Trinity College, Cambridge, where he obtained a fellowship. He began his literary career early, being a contributor to *Knight's Quarterly Magazine* and to the *Edinburgh Review* before he was called to the bar (1826). In 1830 he entered Parliament as Lord Lansdowne's nominee for Calne. He at once distinguished himself, especially as an advocate of the abolition of slavery and of reform. The African trading firm of Babington and Macaulay (his father) having failed, he was glad to accept the position of member of the Supreme Council of India in 1832. His sister Hannah, afterwards Lady Trevelyan, accompanied him to India, where he greatly distinguished himself as president of the commission for drawing up a code of jurisprudence. In 1838 he returned to England, having saved a fair fortune, and again entered Parliament, as member for Edinburgh. He was Secretary for War from 1839 to 1841, and in 1847 became paymaster of the forces. In 1842 he published the *Lays of Ancient Rome*. In 1848 appeared the first two volumes of his *History of England*, beginning at the accession of James II. Two more volumes, reaching to the Peace of Ryswick (1697), appeared in 1855, when it was evident that failing health would prevent the prosecution of his design even to the end of Queen Anne's reign; but the splendid fragment, with all its faults, achieved an unrivalled success and enriched the author. He was raised to the peerage in 1857, and died at Kensington, never having married. His *Life* by his nephew, Sir George Trevelyan, is one of our best biographies. His *Essays* and the *Lives* originally written for the *Encyclopædia Britannica* are of lasting interest and value.

Macaw, a popular name for New World parrots, generally of brilliant coloration, with the upper mandible greatly curved over the lower, and the tail long and wedge-shaped.

Macbeth, King of Scotland from 1040–59, son of Finleach, slew his predecessor Duncan near Elgin, and apparently usurped the throne, having been Lord of Moray. His wife's name was Gruoch. In 1054 Duncan's sons (who had taken refuge with their uncle Siward, Earl of Northumberland) invaded Scotland, and fought an indecisive battle at Dunsinane; but three years afterwards Macbeth fell at Lumphanan, in Aberdeenshire, and, in spite of the efforts of his stepson, was succeeded by Malcolm, son of Duncan. Macbeth is said to have visited Rome. Shakespeare's version of his history is mostly fanciful.

Maccabæus. [MACCABEES.]

Maccabees, the name of a dynasty of Jewish kings, so called from the surname, Maccabæus, of JUDAS, son of MATTATHIAS (d. B.C. 166), who, with his brothers SIMON and JONATHAN, delivered Judæa from the oppression of the Syrians under Antiochus IV. The three hero-brothers successively held the office of high priest, and Simon was made king. He made an alliance with the Romans, and in B.C. 135 was succeeded by his son, John Hyrcanus, who extended the kingdom. His son, Judas Aristobulus, succeeded in B.C. 105, but died in the next year, when his brother, Alexander Jannæus, became king, and increased the power and glory of the nation, which, however, suffered from the dissensions of the Pharisees, Sadducees, and Essenes—sects which arose during Hyrcanus' reign. Alexander died in 78, and on the death of his queen Salome Alexandra, their sons, Hyrcanus and Aristobulus, disputed the succession, with the result that Pompey conquered Judæa, did away with the royal dignity, and established Hyrcanus II. as high priest. Herod, son of Antipater of Idumæa, expelled Aristobulus' son Antigonus, and put to death (B.C. 35) his grandson Aristobulus III., whose sister Mariamne he married. The Maccabees are also called Asmonæans. The history of the brothers is given in two apocryphal books of the Old Testament, which the Council of Trent adopted as canonical.

MacClellan, GEORGE BRINTON (1826–85), an American general, was born at Philadelphia, and trained at the West Point military school. He served in the Mexican War and the Red River expedition, and on the outbreak of civil war succeeded McDowell after the battle of Bull's Run, and became commander-in-chief (1861). He then commanded the army of the Potomac. Later he compelled Lee to retire from Maryland by the battles of South Mountain and Antietam (September 14–17, 1862); but owing to his apparent indolence he was relieved of his command and retired from the army. In 1864 he was the Democratic nominee for the presidency, but was defeated by Abraham Lincoln. In later life he was superintendent of a railway.

Macclesfield, a manufacturing town and formerly a parliamentary borough (returning two members), of the county of Cheshire, on the river

Bolton, 16 miles S.E. of Manchester. The principal manufacture used to be silk, but its trade and population have dwindled since 1850. The church of St. Michael and the guildhall are fine buildings.

M'Clure, SIR ROBERT JOHN LE MESURIER, born in 1807, entered the navy in 1824. In 1850, as a commander, he took charge of the *Investigator* in the search for Sir John Franklin. During four years of absence he discovered and completed the North-West Passage. Captain M'Clure was rescued by an expedition under Captain Belcher, and, returning to England, was posted, knighted, and rewarded with £5,000. In 1859 he was made a C.B., subsequently commanded the *Esk*, 21, in China, and, becoming a rear-admiral in 1867, died a vice-admiral in 1873. [NORTH-WEST PASSAGE.]

McCulloch, JOHN, M.D., F.R.S., F.G.S. (1773-1835), geologist, mineralogist, chemist, and physician, member of a good Scotch family of Cardoness, Kirkcudbrightshire, was born in Guernsey, taught at Plympton, Penzance, and Lostwithiel; studied medicine in Edinburgh, and gained his diploma in 1791. In 1795 he became assistant-surgeon in the Artillery, and in 1803 he was appointed chemist to the Ordnance. From 1807 to 1811 he practised as physician at Blackheath, after which he was employed until 1832 in various mineralogical and geological surveys of Scotland. He then became lecturer in chemistry and geology in the East India Company's military college at Addiscombe. He died in consequence of a carriage accident very soon after his marriage. Dr. McCulloch published four large geological works, two medical works, and a *Treatise on the Art of Making Wines* (1821).

Macdonald, ALEXANDER (ALASDAIR MAC-MHAIGHOUR ALASDAIR) (1700-80), born at Baliled on Loch Shiel, Argyllshire, was the son of a clergyman. He was intended for the Church or the bar, and for this purpose attended Glasgow University for some terms. When still young he married, and then wandered about for some years teaching and catechising under the patronage of the Society for Propagating Christian Knowledge. Later on he became a Roman Catholic and an avowed supporter of the Chevalier. He held a commission in the Highland army (1745), and helped by his songs and addresses to rouse the clans. After the battle of Culloden he kept in hiding for some time, and then settled on a farm in Weigneig, where he published his poems (1751) under the title *Ais-eiridh na Seam Chanoin Albannaich*. This caused his expulsion from his farm, and he went to Arisaig, where he died.

Macdonald, SIR ARCHIBALD (1747-1826), judge, was born at Armidale Castle, in the Isle of Skye. He was educated at Westminster school and at Christ Church, Oxford, graduating in 1768, he became a student at Lincoln's Inn in 1765, and was called to the bar in 1770. In 1778 he was made a king's counsel, and in 1780 was one of the justices of the grand sessions in Wales. In 1784 he became Solicitor-General under Pitt. He was knighted June 27, 1788, and next day was made Attorney-General. He became member for Hindon

in Wiltshire in 1777, and in 1779 made a violent attack on Lord North, for which he afterwards apologised. In 1793 he became Lord Chief Baron of the Exchequer, and, after serving for twenty years on the bench, retired (1813) and was made a baronet.

Macdonald, ÉTIENNE JACQUES, MARSHAL (1765-1840), was born in France, of a Scotch family which had settled there. He fought for the Revolution, and distinguished himself at Jemappes; but his most famous exploits were those undertaken on behalf of Napoleon. He defeated Suwaroff at Trebbia (1799), and in 1801 marched across the Splügen Pass. He was present at Wagram, Lutzen, and Bautzen, but was defeated at the Katzbach. He was made a peer by the Bourbons. From 1816 he attended the discussions in the Chamber of Peers.

Macdonald, JOHN (1769-1831), a military engineer, was the youngest son of Flora Macdonald, the Jacobite heroine. He was educated in Portree and Edinburgh, and in 1780 obtained an Indian cadetship. For about eight years he was military and civil engineer in Sumatra, becoming first lieutenant in 1794. He made many maps and charts of Sumatra, which are now in the British Museum, and made observations on the variation of the magnetic needle. In 1800 he retired on half-pay, and held various posts till he became field officer of the Cinque Ports Volunteers, when he made a reconnaissance in an open boat of the preparations for invasion at Boulogne. His engineering skill was best shown in his improvements of naval and military telegraphy. Macdonald became an F.R.S. in 1800. His writings include many translations and other works, among which are *Experiments with Machine-driven Fuses for Time Signals* (1819), *A New System of Telegraphy* (1817).

Macdonald, SIR JOHN ALEXANDER (1815-92), was born in Scotland, but when still quite young was taken to Canada, and there educated at Kingston. He was admitted to the bar in 1836, and nine years later became member of Parliament for Kingston. He held numerous posts, being a member of the Executive Council, receiver-general, commissioner of Crown lands and Attorney-General, and in 1869 became Premier, which post he held till 1873, when he resigned owing to the Pacific Railway scandal, but resumed office in 1878. He was the recognised leader of the Conservatives from 1873, and took an active share in promoting the Canadian Pacific Railway and the Canadian federation movement. He was made a Privy Councillor in 1872, K.C.B. 1867, G.C.B. 1884.

Mace. 1. A symbol of authority, consisting of a staff about 5 ft. in length, to which is attached a heavy metal head. The mace was originally a weapon of attack, and was used as such during the Middle Ages; the head was usually surrounded with spikes, which disappeared when it was adapted to more peaceful purposes. The mace laid on the table of the House of Commons and those belonging to the City Corporations are symbols of the joint authority of these bodies. As a badge of office, with much the same signification, it is borne in front of

the Lord Mayor and the Vice-Chancellors of the two universities.

2. The aril or fleshy outgrowth over the seed of the nutmeg (q.v.). It is of a net-like form and, when fresh, of a scarlet colour, serving to attract frugivorous birds; but, when dry, is brown. It is imported in cases weighing from 60 to 120 lbs. and forms a cheap spice. It contains about $4\frac{1}{2}$ per cent. of an aromatic oil; but the *oil of mace* of commerce is prepared from small unsaleable nutmegs.

Macedonia, ancient name of part of northern Greece. The Macedonia of Herodotus was bounded on the east by the river Lydias and the Thermaean Gulf, on the south by Thessaly, on the west by Mount Pindus, and on the north by Mount Lyncestus. Philip's kingdom originally extended to the Strymon on the east, but did not include the Thracian Chersonese. He added that Chersonese and the district between the rivers Strymon and Nestus, Pæonia on the north, and on the west part of Illyria as far as Lake Lychnitis and the river Drilo. Under Alexander Macedonia became the most powerful state in the world. The Roman province of Macedonia (B.C. 166) included Illyria and Thessaly and Thrace as far towards the east as the river Hebrus (Maritza).

Macfarren, SIR GEORGE ALEXANDER, (1813-87), a prominent musical composer, was born in London. He was educated at the Royal Academy of Music, where he became a professor in 1834. In 1875 he was made principal of the Academy, and professor of music at Cambridge, and in 1883 he was knighted. His most celebrated works are *The Devil's Opera* (1838), *Robin Hood* (1860), *Don Quixote* (1846), his oratorios *St. John the Baptist* (1873), *The Resurrection* (1876), *Joseph* (1877). He wrote many musical treatises. For several years he was blind, but the affliction did not seem to affect his work.

McGillicuddy's Reeks, a range of the Kerry Mountains, in Ireland, south of Dingle Bay, one peak of which, Carran Tual, has the highest elevation in Ireland, namely 3,414 ft.

Machærodus, the "sabre-toothed tigers," are a genus of extinct Carnivora remarkable for the enormous development of their canine teeth, and also for a wide distribution both in time and space. They occur in the Miocene beds of the Val d'Arno, Italy, of Auvergne and of Eppelsheim; in the sandstones of the Sivalik Hills (q.v.), India; in Pampas deposits and bone-caves of South America; in the Cromer Forest-bed and, apparently associated with human remains, in Kent's Cavern (q.v.), Torquay.

Machiavelli, NICCOLO (1469-1527), diplomatist, historian, and poet, was born at Florence of a noble family. He became at an early age Chancellor, and then State Secretary, of the Florentine republic, and conducted several important embassies with signal address. Louis XII. insisted on a council being held at Pisa, which induced Pope Julius II. to unite with Ferdinand of Aragon in restoring the Medici (1513); whereupon Lorenzo de' Medici deprived Machiavelli of his civic dignities, and soon after, Lorenzo's uncle, Cardinal

Giovanni de' Medici, had him banished after imprisonment and torture, but on his elevation to the Papacy as Leo X. (1514) the banishment was annulled. Machiavelli returned, and wrote his famous treatise on government, *Il Principe* (*The Prince*), dedicating it to Lorenzo, whereupon he was received into favour by the Medici, and under Clement VII. (cousin of Leo X.), after an interval of suspicion and disfavour, was employed in the service of the state; but, after all, on his return from the defence of Tuscany against Charles V. he fell into neglect, and died in poverty. *The Prince* has been generally misunderstood and condemned, so that the author's name has become a byword for unscrupulous and criminal policy; but its immorality is that of Italy in the 15th century; and, if Lorenzo was advised to gain and keep power by treachery, oppression, and even crime, he was to use it for the union and freedom of Italy, and for beneficent purposes generally. The best of Machiavelli's comedies, *The Mandragola*, is, in spite of an unsavoury subject, full of humour, and shows that he thoroughly understood the dramatic art. His *History of Florence* (in eight books) from 1215 to 1492 is a work of the highest merit and value, and he is said to have left materials for its completion to Guicciardini. In his *Discourses on the First Ten Books of Livy* (composed before *The Prince*) he treats of the conditions requisite for the maintenance of a republic and of the crises which make for its downfall. Sir Henry Maine ascribes to him a large share in forming the modern conception of the State.

Machins, a people of East Turkestan, occupying the oases south and south-west of the Tarim basin, as well as the Keria Mountains bordering this depression on the south. The Machins regard themselves as the true aborigines of East Turkestan, though the highlanders alone (Malchas) have preserved the primitive type: large cheek-bones, skull angular and flattened at occiput, rather thick lips, dark brown complexion, eyes generally black, but also blue or grey, hair also black, chestnut, and even reddish, pointing at mixed Mongolic and Caucasian descent, probably from the *Tssians*, *Sakas* and *Tukharas*, who, according to the Chinese records, occupied this region long before the Christian era. They are nominal Mohammedans, though still addicted to polyandry as well as polygamy and practising many pagan rites; speech a Turki dialect (Prejevalski).

Mack, KARL VON (1752-1828), an Austrian general who rose from the ranks, becoming a captain in the war with Turkey. He was recommended by Laudon to the emperor. In 1793 he was quarter-master-general, and in 1797 commanded the Army of the Rhine. The next year he was defeated by the French near Naples, fled to their camp and was sent as prisoner to Dijon. Yet in 1804 the emperor trusted him with a chief command, which resulted in the historic capitulation of Ulm, when Napoleon took 28,000 Austrian prisoners. Mack was tried for treason and condemned to death, but his sentence was commuted and he was after a time released from prison.

Mackay, CHARLES, LL.D. (1814-1889), songwriter and journalist, was born at Perth, and educated at the Caledonia Asylum, London, and in Brussels. From 1835 to 1844 he was assistant sub-editor to the *Morning Chronicle*, and then became editor of the *Glasgow Argus*. He was afterwards on the staff of the *Illustrated London News* and the *Times*. He is best known for his popular songs, many of which were set to music by Sir Henry Bishop.

Mackenzie, SIR ALEXANDER, an explorer of N. America, born in Scotland, emigrated to Canada where he entered the service of the North-West Fur Company. His energy caused him to be appointed in 1789 to explore the tract north-west of Lake Athabasca. He then discovered and traced the Mackenzie river. In 1792 and 1793 he traversed the unknown regions between Upper Canada and the Pacific, encountering most serious hardships and dangers. He was knighted shortly after the account of his travels appeared in 1801.

Mackenzie, SIR GEORGE (1636-91), born at Dundee, a cadet of the family of the Earl of Sleaforth, showed great precocity in classical and other studies. He became an advocate in 1659, and in 1661 defended the Marquis of Argyll on his trial for high treason. Before the Restoration he published several moral essays and a poem, *Celia's Country House and Closet*. Soon after the Restoration he was appointed justice deputy, or assistant chief-justice. In 1669, as representative of the county of Ross, he delivered a fine speech against the union between England and Scotland. In 1677 he became king's advocate, and earned infamy in that capacity as a cruel instrument of oppression. In 1686 he lost his office for opposing the efforts of James II. to restore the Roman Catholic ascendancy, but regained it in 1688. At the time of the Revolution his public life ceased; after founding the Advocate's Library, Edinburgh, he retired to Oxford. He died at St. James's.

Mackenzie, HENRY (1745-1831), born and educated in Edinburgh, son of a physician in good practice; followed the legal profession, studied exchequer practice, and became partner and then successor to Mr. Inglis as attorney to the Crown, notwithstanding his early fondness for literature. In 1771 he published *The Man of Feeling* anonymously, the success of which induced a Mr. Eccles to claim the authorship and forge the manuscript of the whole novel. Subsequently *The Man of the World* and *Julia de Roubigné* were produced, the three novels forming a series connected by the relation of their respective aims. He also edited the essays of the Mirror Club, formed about 1778 by young men of letters, most of whom were connected with the Scottish bar, under the titles of the *Mirror* and *Lounger*. He also published two tragedies and two comedies, and many papers, some of which were read before the Royal Society of Edinburgh. In 1804 he was made Comptroller of Taxes for Scotland.

Mackerel, a general name for fish of the Acanthopterygian family Scombridae, which includes many valuable food-fishes. The species are

abundant in all tropical and temperate seas. The elongated, generally spindle-shaped body is naked or covered with small scales; two dorsal fins and, usually, finlets are present. They are extremely active, and wander in large shoals, approaching the coast periodically, probably in pursuit of the smaller fishes on which they feed. The type-genus *Scomber*, with seven species, has nearly the range of the family, but is absent from the eastern shores of South America. The body is covered with small scales, and there are finlets behind the dorsal and anal fins. *S. scomber*, the Common Mackerel, ranges over the north Atlantic Ocean and the North Sea. It is a very valuable food fish, of an average length of about fifteen inches, shapely in form, and beautiful in coloration. The upper surface is greenish-blue, with vertical black bars; below the hue is silvery white. The British mackerel-fishery is an important industry. The first shoals appear early in the year, and about the end of May, when the fish are in the best condition, immense numbers are met off the Scilly Isles. The bulk of these come up Channel, but some go northwards into the Irish Sea. Nets are chiefly used in their capture, but very many are taken with lines baited with anything bright. They spawn at some distance from land, and the eggs float on the surface. *S. colias*, the Spanish Mackerel, sometimes taken on the Cornish coast, is spotted on the sides, and differs from the Common Mackerel in having a swim-bladder. [HORSE-MACKEREL, ROCKLING, SCAD, TUNNY.]

Mackintosh, SIR JAMES (1765-1832), jurist, publicist, historian, and philosopher, was born at Dorish, Inverness-shire, educated at Fortrose, Ross-shire, and King's College, Aberdeen, and received a medical degree in 1787 after three years' study at Edinburgh. In 1792 he published *Vindiciæ Gallicæ*, an answer to Burke's *Reflections on the French Revolution*, and thereby became famous. About this time he entered Lincoln's Inn, and was soon called to the English bar. He defended Peltier when he stood his trial for libelling the First Consul of France (Bonaparte), and soon after was appointed Recorder of Bombay. From this post he retired in 1811 with a pension of £1,200 per annum. He entered Parliament in 1813 as member for Nairn county, and from 1818 sat as member for Knaresborough. He was made a Privy Councillor in 1828, and in 1830 a commissioner for Indian affairs in Earl Grey's Administration. His incomplete *History of the British Revolution* was published in 1834. He was a contributor to the *Edinburgh Review*, and wrote an important work on ethics.

Macklin, CHARLES (1690-1797), actor, dramatist, and centenarian, began life as a Dublin bargeman, but went to England with a company of strolling actors of comedy in 1711. In 1716 he appeared in London, and in 1741 became famous as Shylock. He retired from the stage in 1789. His comedies, *The Man of the World* and *Love à la Mode*, are full of humour.

Mackonochie, ALEXANDER HERIOT (1825-87), born at Fareham, in Hampshire, educated

at Bath, Exeter, and Wadham College, Oxford, graduated in 1848, and was ordained the next year. He was curate at Westbury in Wiltshire, and Wantage, in 1858 went to St. George's-in-the-East, and in 1862 became curate-in-charge of St. Alban's, Holborn. From 1867 to 1882 he was frequently prosecuted for alleged excesses in ritual, and in 1882 he resigned his cure to oblige his bishop. When staying at Ballachulish he lost his way in the forest of Mamore, and died from exposure.

Maclaurin, JOHN (1698-1746), born at Kilmoddan, took his M.A. degree at Glasgow at the age of fifteen, and when only nineteen was elected professor in the Marischal College, Aberdeen. In 1725 he became professor of mathematics in Edinburgh University. Of his mathematical works the most famous is his *Treatise on Fluxions* (1742).

Macleod, DR. NORMAN (1812-72), a Scottish divine, was born at Campbeltown, Argyshire. He was educated at Glasgow, Edinburgh, and in Germany. He was minister, first at London, then at Dalkeith (where he published *The Earnest Student* (1854), and became editor of the *Edinburgh Christian Magazine*), and eventually, in 1851, of Barony Parish, Glasgow. In 1854 he became one of the chaplains to the Queen, and Dean of the Order of the Thistle, and in 1858 received an honorary degree of D.D. He became editor of *Good Words* in 1860. In 1867 he visited the mission stations of India, and on his return published *Peeps at the Far East*.

MacLise, DANIEL, R.A. (1806-70), a distinguished painter, was born at Cork. His drawing attracted attention at school, and in 1820 he gave up a situation and took to art. In 1825 he made a successful drawing of Sir Walter Scott. He then opened a studio, and eventually became a student of the Royal Academy in 1829. In 1833 he became famous by his *All Hallow Eve*. He was elected associate (1836) and member (1840) of the Royal Academy. He painted the frescoes in the Royal Gallery of the House of Lords.

MacMahon, MARIE EDMÉ PATRICK MAURICE DE (1808-93), Duke of Magenta and Marshal of France, was educated at the military college of St. Cyr. He distinguished himself in Algeria, and became brigadier-general in 1848. During the Crimean War he was in command of a division, and assisted in storming the Malakoff. He took part in the Austrian campaign, and won the battle of Magenta, and then became Governor-General of Algeria. During the Franco-German War MacMahon commanded the First Army Corps, and was defeated at Weissenburg and Wörth. Then whilst trying to relieve Metz he was forced to capitulate at Sedan, where he was severely wounded. In 1873 he was elected President of the French Republic, but resigned in 1879 after the failure of the anti-Republican reactionaries, whose tool he was.

Macon, a town of France, in the department of the Saône-et-Loire, 33 miles south of Chalon, on the right bank of the Saône. The streets are narrow, but it contains some fine modern public buildings, and has an extensive quay. The old

ramparts are laid out as promenades. It is noted for its wines.

Macpherson, JAMES (1738-96), born in Inverness-shire, published *Remains of Ancient Poetry* translated from Gaelic or Erse. Being commissioned to collect more materials of the kind, he composed two volumes of prose poems, which he asserted to be translations of Gaelic poems by Ossian, son of Fingal, a bard who flourished about A.D. 300. These poems raised a hot controversy, and were much admired even by those who detected the imposture. They were based on bardic ballads and traditions. He became agent to the Nabob of Arcot, and sat in the House of Commons 1780 to 1790.

Macready, WILLIAM CHARLES (1793-1873), was born in London. His father, lessee and manager of several provincial theatres, sent him to Rugby and Oxford, intending him for the bar, but from lack of funds he had to join his father's company in Birmingham (1810). In 1816 he appeared in Covent Garden, and played with success in America in 1826, and in Paris in 1828. He became manager of Covent Garden in 1837, and of Drury Lane 1842, but, owing to his losses, had to give up. He revisited America from 1849 to 1851.

Macrura, a group of Crustaceans (order *Decapoda*) containing the lobster, shrimp, prawn, etc. The abdomen is covered with a hard shell.

Madagascar, the name of a large island in the Indian Ocean, 230 miles from the east coast of Africa. The inhabitants, called Malagasy (q.v.), form a single race, but are divided up into tribes. The capital is Antananarivo. In 1820, during the reign of Radama I., Christian missionaries began to teach, but in 1828 his wife Ranavalona closed the island to Europeans and persecuted the Christians. Her son, Radama II., reopened the island and freed the slaves. The principal exports are cattle, hides, indiarubber, rice, and valuable woods. It is now under a French protectorate (1890).

Madder Red, a dyestuff obtained from the madder plant, *Rubia tinctorum*. The dye is obtained from the roots, and the quality varies greatly with the age of the plant and with the climatic conditions of the country where grown. The roots are either sun or kiln-dried, threshed to remove the outer skin, cut and ground in stone mills. Frequently, however, the last process is omitted, and the dyestuff sold as the cut pieces. The chief constituent of the root of importance in dyeing is *alizarin* (q.v.), but a large number of other compounds are also present. Though formerly immense quantities of this substance were employed in the dyeing industry for the production of Turkey red, obtained chiefly from France, Germany, Italy, and Turkey, yet of late years the artificially-prepared alizarin has almost entirely replaced the natural substance.

Madeira. 1. An elevated island off the west coast of Africa, belonging to Portugal, long. 17° W., lat. 32° 30' N. It is surrounded by lofty cliffs broken by a few bays in which fertile valleys terminate, and

is a well-known resort for sufferers from consumption. The capital is Funchal. The principal produce used to be the rich and delicately-flavoured wine which bore its name, but the vines were almost exterminated by oïdium (q.v.); their culture is reviving, but now cochineal and sugar are largely substituted.

2. A large river of South America, a tributary of the Amazon. It rises in the mountains of Chuquisaca (Peru), and has a course of 1,100 miles; but the name Madeira only applies to the lower part, which flows to the north-east into the Amazon. It is named from the quantity of timber (*Madeira*) carried down by the stream.

Madi. 1. A people of East Sudan on both banks of the White Nile below Lake Albert Nyanza; the Egyptian station of Dufli was in the territory of the Madi, who greatly resemble their Lur and Shuli neighbours both in appearance, usages, and their fantastic style of head-dress. But the language is quite distinct and, according to Emin Pasha (*Letters*), is related to that of the Zandeis (Niam-Niam). 2. A Negro tribe occupying the right (north) bank of the Welle about lat. $3^{\circ} 40' N.$; probably akin to the Mombuttus (Junker. *Travels*, ii.). 3. A low caste people of the Bustar district, left bank of the Godavery, British India; Gonds of Dravidian speech; pagans.

Madison, JAMES (1758?-1836), born in Virginia, studied for the bar, obtained a public office when about twenty-two years old, and was early elected to Congress. He soon became distinguished for eloquence, and contributed effectively to the drafting of the Constitution. He became Secretary of State under Jefferson, and in 1809 was elected President. He strongly resented the celebrated Orders in Council and the outrages inflicted on American shipping and seamen. Madison's policy and British obstinacy led to war with England in 1812, in which America had a fair and unexpected share of success, though her commerce suffered seriously, and in 1814 Great Britain was glad to make peace. Madison, at the end of his second term, in 1817, retired into private life.

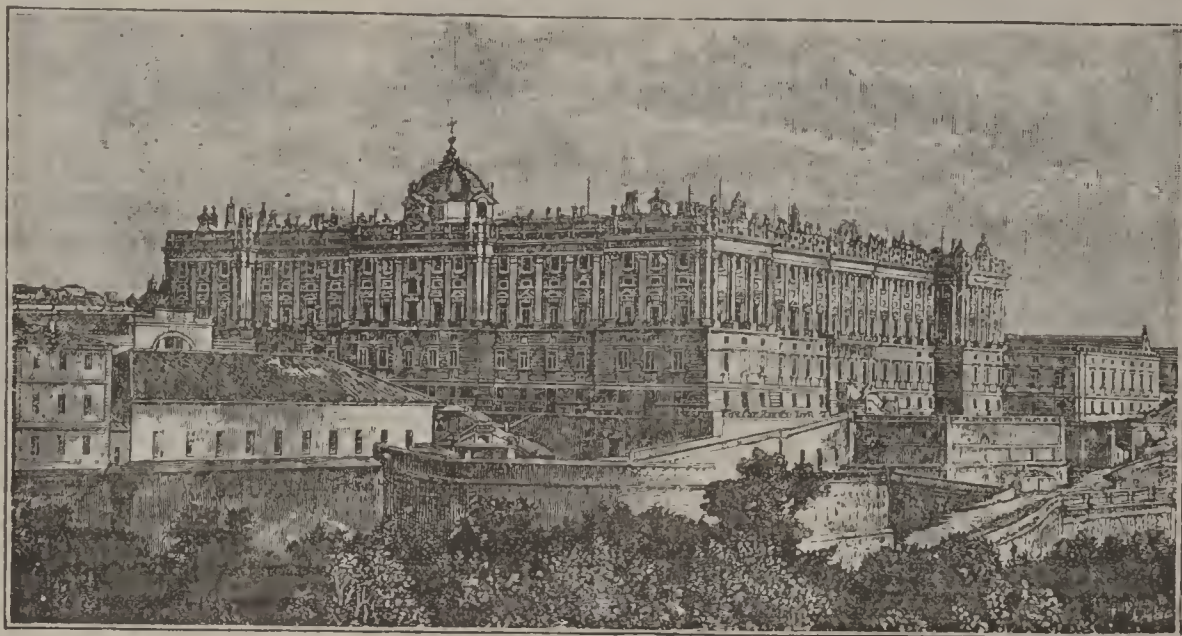
Madness. [INSANITY.]

Madoc, a prince of Welsh tradition, who in the 12th century sailed with ten ships and three hundred men far to the west and discovered land. Some detect traces of these voyagers in America.

Madras, PRESIDENCY OF. the southern portion of the British possessions in India, comprising most of the territories south of the Krishna. Part of it is governed by dependent princes, the rest by the governor of Madras. Area. 149,092 square miles. **MADRAS, CITY OF,** capital of the Presidency,

a very large city on the east (Coromandel) coast, lat. $13^{\circ} 5' N.$, long. $80^{\circ} 21' E.$ The Black Town is inhabited chiefly by Hindoos and Indian Moham-medans, crowded about Fort St. George in narrow, dirty streets. The Europeans of the better class occupy detached houses in the suburbs. It has no proper harbour.

Madrid, the capital of Spain and of New Castile, lies at a height of 2,060 ft. above the sea on the river Manzanares, lat. $40^{\circ} 25' N.$, long. $3^{\circ} 28' W.$ It is a large city, the older portions being badly built,



THE ROYAL PALACE, MADRID.

Frith & Co., Reigate, phot.

with narrow, tortuous streets. There are two palaces, the Palacio Real at the western end of the oblong which the city forms, the Buen Retiro at the eastern end, where is also the *Prado*, or great park. The principal square is very handsome, and is surrounded by a piazza. There are many fine streets with lofty, well-built houses.

Madrigal, a short lyrical poem, generally of an amorous character. Petrarch and Tasso in Italy, and Lodge, Carew, and Suckling in England, are named amongst the poets who excelled in this branch of the art. In *music* the term denotes a song of elaborate character, but without instrumental accompaniment, written in five or six parts. The musical madrigal arose in Flanders in the 15th century, and spread thence to Italy, England, and other countries.

Madura. 1. The name of an ancient territory of South India (celebrated in Hindoo poems), of which the limits are unknown, but it was probably bounded by the sea to the S. and E., and the Western Ghauts on the W.

2. A city in the Madras Presidency, containing a vast palace of the former rajahs and one of the most remarkable temples of India. In Hindoo mythology it was the capital of the territory of the same name.

Madura Foot. A peculiar disease of the foot met with in the natives of some parts of India, and believed to be caused by a parasitic fungus.

Madvig, JOHAN NIKOLAI (1804-86), a celebrated Danish scholar, for many years professor of

Latin in the university of Copenhagen; best known for his Latin grammar and edition of Livy.

Mæcenas, CAIUS CILNIUS (d. 8 B.C.) a Roman statesman and patron of letters, contemporary of Augustus, whose friend he was before he became emperor. He it was who arranged the marriage of Octavius, and later the peace of Brundisium, which made a partial truce between Augustus and Antony. It was in 40 B.C. that he first appears as the confidential adviser of Augustus, and in the next year he began to patronise Horace, who was perhaps introduced by Virgil and Varius, who were already well known to him. Horace repaid the attentions of Mæcenas by extolling him in his poems, and that Mæcenas esteemed Horace is shown by the fact that in his will he recommended the poet to the emperor's attention. In his latter days Mæcenas seems to have fallen somewhat out of favour, and spent most of his time at his house on the Esquiline.

Maëlström, a whirlpool or, more strictly, a current, between Moskenäs and Mosken, two of the Lofoden Islands (q.v.). It was formerly an object of the greatest terror, but it is now known that the navigation presents no extraordinary difficulties, unless the wind and current are directly opposed one to another, when it becomes extremely dangerous.

Maestricht, a town of Limburg, in Holland, whose name denotes its position at the crossing of the Maas, it having been a Roman military post on the way to Cologne. It is 18 miles N.E. of Aix-la-Chapelle, and the same distance N.W. of Liège, most of the town being on the left bank, and joined to the suburb Wijk by a stone bridge. It is a garrison town, and was strongly fortified; and it is since the removal of the fortifications and the opening of railways to Aix, Liège, and Hasselt that the commerce and industries have developed. The principal trade is in earthenware, glass, arms, lead, tools, copper, zinc, tobacco, cigars, and beer. There is a 17th-century town-house of some note, the church of St. Servatius has a *Descent from the Cross* by Vandyk, while the church of Our Lady has two old crypts and a fine 16th-century choir. At Pietersberg, in the neighbourhood, are some sandstone quarries which are renowned for their wonderful galleries, many thousands in number and extending for miles, in which have been found some remarkable fossils. The district retains its own dialect.

Mafia, a secret society in Sicily, analogous to the Camorra (q.v.) of Naples.

Magadhi, a Prakrit (vulgar Sanskritic) language, the mother tongue of Gautama Buddha, generally but wrongly supposed to be identical with the Pali of Buddhist literature; was formerly current throughout Berar, and may be regarded as the source of the eastern Ganurian languages (Bengali, Oriya of Orissa and Assamese).

Magar, a people of the southern slopes of the Himalayas, whose territory lies between the Marma and Thakshya, Nepal; three main branches: Rana, Thapa and Alaya with 19, 20, and 29 tribes respectively; practise Hindu rites and speak both

Khas and a Tibetan dialect. From the resemblance of the name, attempts have been made to affiliate the *Magars* to the *Magyars* of Hungary, with whom they have no connection, being of nearly pure Tibetan stock.

Magdalene, ST. MARY, a saint of the Christian Church as to whose identity there is some doubt, some considering her to have been born at Magdala, near Tiberias, and to be she out of whom Christ cast seven devils, others taking her to be the woman that was a sinner and anointed Christ's feet. This is the view of St. Gregory and the Church generally.

Magdeburg, the capital of the Prussian province of Saxony, and one of the strongest fortresses of Germany, is on the left bank of the Elbe, consisting of the town proper and the four suburbs Friedrichsstadt, Neustadt, Sudenburg, and Buckau. Between the old and new Elbe, and separating the main town from Friedrichsstadt, is the island of Werder, which contains the citadel, and is connected with each bank by a bridge. There is one good street, and a fine promenade along the Elbe. A park occupies the site of a convent suppressed in 1810. The 13th- and 14th-century cathedral is the burial-place of Otho the Great, and contains a fine monument to Archbishop Ernest (1497), and there is a church of the 12th and 13th centuries. Among the chief buildings are the town-hall, with a statue of Otho in front, the theatre, governor's house, railway station, and exchange, and there are some fine houses in the old market. There is much trade in agricultural produce, manufactured goods and wines; and among the chief industries are iron-works, distilleries, cotton-mills, and the manufacture of woollens, sugar, silk, spirits, tobacco, chocolate, chicory, organs, and pianos. It is the headquarters of an army corps, the seat of the provincial court of appeal, and has many good educational establishments. In 1631 the town was sacked and almost entirely burnt, with the exception of the churches, and was finally restored to Prussia in 1814.

Magdeburg Hemispheres are two hollow hemispheres made of some strong material, such as brass or gun-metal, which can be accurately fitted on each other. Before putting them together it is usual to smear the edges with grease. The hollow sphere then formed is exhausted of air through a stopcock with which one of the hemispheres is provided. After the exhaustion is complete it is found that an immense force is needed to pull the two parts asunder, the force increasing with the diameter of the hemispheres. The two hemispheres are pushed together by the pressure of the atmosphere; so, if a complete vacuum were obtained the force required to separate the parts would be 15 lbs. multiplied by the number of square inches in the base of either hemisphere.

Magellan (properly MAGELHAENS), FERNANDO DE, Portuguese voyager, born about the year 1470, entered the service of Spain, and undertook to discover a new route by the westward to the Moluccas. In October, 1520, in this endeavour, he traversed the strait which now bears his name. In the following

month he discovered the Pacific, and on March 6th, 1521, sighted the Mariannes. In an unprovoked action with the natives of Matan Magellan was killed in 1521. The expedition, or so much as remained of it, returned under Sebastian del Cano.

Magellan, STRAITS OF, between Patagonia and Tierra del Fuego, are 375 miles long with a breadth of from 12 to 17 miles. The western part, which is the narrower, is enclosed by mountains well covered with wood, and has some good harbours, and the wider eastern part is fringed with pampas. There is a strong current, and west winds are prevalent. In the earlier part of the present century the straits were surveyed by King and Fitzroy.

Magellanic Clouds are curious cloud-like masses of a milky white colour, which are seen in the southern heavens, the greater lying between R.A. 4 h. 40 m. and 6 h., and N.P.D. 156° and 162°, and the lesser between R.A. 0 h. 28 m. and 1 h. 15 m., and N.P.D. 162° and 165°. The telescope reveals the fact that they contain not only stars—as in the Milky Way—but also nebulae, the whole appearing as a dense mass at an enormous distance.

Magenta. [FUCHSINE.]

Maggiore, LAGO, the most westerly of the Italian lakes, is 38 miles long, with a width varying from 2 to 7 miles, and is 640 feet above sea-level. The southern part is in Italy, and the northern in the Swiss canton of Ticino, the river of the same name flowing in at the north and out at the south of the lake, and in the south-west are the Borromean Islands. The depth is over 1,100 feet. To the W. and part of E. are granite mountains rising to a height of 7,000 feet, and to the S. and E. are vine-clad hills. Fish abound, and the fishing is for the most part preserved.

Magh (MOGH, MUG), a non-Aryan people of east Bengal, probably of Kolarian stock; but the name is now improperly applied in Bengal to the lowland inhabitants of Arakan generally, whose proper name is Kiungtha. The true Maghs, who give their name to the Meghna estuary of the Brahmaputra, are a vigorous, hardy people, daring boatmen, and skilled agriculturists. Those of Arakan call themselves Miam-ma, *i.e.* Burmese, use a slightly modified form of the Burmese alphabet, and have long been Buddhist with a moderate share of Hindu culture.

Maghrâwa, a branch of the Atlas Berbers, formerly very powerful, now reduced to a few broken tribes scattered over north Morocco, Algeria, and Tunis. They are the Makhurebi of Ptolemy, and in the national genealogies they appear as a branch of the great Zenata family. On the arrival of the Arabs (7th century) they were amongst the first Mauritians to embrace Islam, but during the long intestine wars of later times they were nearly annihilated in the 14th century. The chief surviving group appear to be the Laghwats (already mentioned by Ibn Khaldun), who give their name to the town and oasis of Laghwat, south of the Jebel Amur, Algerian Sahara.

Magic is now a term of very wide import. At

first it chiefly consisted of astrology and the interpretation of dreams, as practised by a priestly caste, so that then the magic art was distinctly religious, and openly practised without any rebuke (*cf.* Dan. iv. 9; v. 11). It could not have been long before magic came to deserve the definition which Grimm gave of it—the illicit or harmful use of supernatural powers, thus marking it off from the faculty of working miracles, which is legitimately exercised. This definition was anticipated by Plato, who denounced sorcery—a particular form of magic—as an illegitimate method of forcing the gods to be helpful to man. Hence magic, at first religious, diverged more and more widely from religion as the ethical side of the latter, rather than the ceremonial, was developed. The term “magical arts” in classic times was synonymous with sorcery. People who wanted to compass unrighteous ends, or even righteous ends by unrighteous means, went to the magician, believing him to have the power to compel supernatural beings to do his will; and so magic—the illegitimate system of communication with the unseen world and influencing the powers thereof—grew up almost side by side with the legitimate system of religion. As Christianity spread and replaced heathen faiths, the gods of the latter were regarded as demons by the new teachers, and—though, of course, in a less degree—by their converts. This gave rise to a curious state of things. The old rites and beliefs lingered on, and, having ceased to be religious, became magical. They had in many cases the same end as those to which they had given place, but they stood on a lower plane, and the end was sought by what the new teachers considered illegitimate means. So even after the spread of the new faith among a people recourse was often had to the priests of the old; and Scott in his *Demonology* tells how the Scotch Presbyterians would send for a Roman priest to lay a ghost or exorcise an evil spirit that defied the efforts of their own ministers. The principle that underlies nearly all magical rites is that of association; but when the ceremonies are examined the association or connection is seen to be subjective, not objective. It exists only in the mind of the magician and of the person who seeks his aid. One of the commonest ends sought by magic was infliction of injury. To effect this, an image was made representing the person whom it was sought to injure, and the image was dried or melted before the fire, pierced with pins and thorns, shot at with a bow and arrow, or in later times with firearms, in the vain hope that the person represented would suffer thereby. The practice is still widely spread. This form of magic was also known as *black* magic to distinguish it from *white* magic, which was used to benefit, not to injure. The term magic is also applied to conjuring tricks performed by sleight of hand or with the aid of apparatus. *Natural magic* is the art of producing apparently supernatural effects by superior knowledge of the powers of nature. [DEMONOLOGY, INCANTATION, WITCHCRAFT.]

Magic Lantern is an optical instrument for throwing on to a screen magnified images of

pictures which are painted or photographed on small squares of glass and are called "slides." The date of its invention is uncertain, but an indication of it is to be found in the writings of the Jesuit Kircher, who lived in the 17th century. Until about thirty years ago it was used chiefly as a plaything for showing comic pictures, or as a means of manifesting so-called magic phenomena. Owing chiefly to the advance in photography, lantern slides are now largely used by lecturers in place of diagrams, while a slight alteration in the construction of the lantern makes it possible for scientific experiments, done on a small scale, to be rendered visible to a large audience. In its simplest form the lantern consists of a box containing a source of light with a chimney above it, a reflector behind it, while in front of it is a circular opening fitted with a brass tube. At the inner end of the tube is a lens called the "condenser," then comes a slit for the reception of the slide, and beyond that another lens called the "objective," in the focus of which, between it and the light, the object is placed. The screen is placed some distance in front of the objective. An oil-lamp was at one time the only source of light used. An improvement upon this was the argand gas-burner, but the best results are obtained with limelight or electric light. The condenser causes the light to illuminate the slide to a very high degree, while the objective forms an image of it on the screen. The slide must be put in the lantern upside down, as the image on the screen is inverted. The objective can be moved towards and away from the slide, and so enable one to focus the instrument and obtain a clear and distinct image. A lantern can only be used successfully when worked in a darkened room.

Magic Square is a square divided into a number of smaller squares or cells, all equal, and each containing one of a series of numbers. These numbers are so placed that the sum of those in each row, column, or diagonal is the same. If the numbers from 1 to 16 are arranged in the following rows, 1, 15, 14, 4; 12, 6, 7, 9; 8, 10, 11, 5; 13, 3, 2, 16; they will form a magic square, the sum of the numbers in any row, etc., being 34. From very early times mathematicians amused themselves by constructing these squares. They are supposed to have been introduced into Europe about the 15th century, but to have been known in India from the earliest times. Astrologers invested them with mystical meaning; a square containing only one cell with the number 1 represented the unity of the deity, squares containing 3, 4, 5, 6, 7, or 8 cells in a row were associated with Saturn, Jupiter, Mars, the sun, Venus and Mercury, the planets of the old astrologers. The squares, engraved on stone or metal, were used as talismans or charms to protect the wearer against evil, and are still to be found in India. The theory of the formation of such squares has been chiefly worked out by French mathematicians.

Magilp, a medium employed in oil-painting, and which consists of a mixture of mastic varnish and linseed oil.

Maginn, WILLIAM (1793-1842), was born at Cork, and educated at Trinity College, Dublin, where he showed himself an apt scholar, and took his LL.D. at 23. After teaching for some years in Cork, he came to London to try his fortune in literature, having already made his appearance in *Blackwood's Magazine* with a Latin translation of *Chery Chase*. In 1824 he was the Paris correspondent of a short-lived newspaper, and in 1828 joined the staff of the *Standard*. In 1830 he was engaged on *Fraser's Magazine*, and in 1837 he contributed his Shakespeare papers to *Blackwood*. Besides many miscellaneous works in prose and verse, his Homeric ballads deserve mention, as well as the fact that he wrote two novels. His later life was clouded by drink and debt, and part of his last year of life was spent in the Fleet prison.

Magliabecchi, ANTONIO (1633-1714), an Italian bibliophile, who, in spite of his occupation till 1673 as a goldsmith, studied Greek, Latin, and Hebrew, and was an omnivorous devourer of books, with which his house was filled. He neglected everything for the sake of reading, and his prodigious memory for details enabled him to retain almost all he read. In 1673 he became Court Librarian to the Grand Duke of Tuscany, to whom he bequeathed his library of 30,000 volumes, which the duke afterwards presented to Florence.

Magna Charta, the charter signed by John (q.v.) at Runnymede in 1215. It provided against the abuse of the royal prerogative, and may be regarded as the basis of the English constitution.

Magna Græcia, the name given in history to the cluster of Greek colonies founded, for the most part, in the 8th century B.C., in southern Italy. The chief of these colonies, in the order of their supposed foundation, are Cumæ, Sybaris, Crotona, Rhegium, Locri, Tarentum, Siris, Metapontum, and Velia. Pythagoras visited Crotona in 530. For a long time the commerce of these colonies flourished greatly, but struggles with each other, luxury, and warfare with the neighbouring races, gradually weakened them, and they fell a prey to Rome early in the 3rd century B.C., the last to lose its independence being Tarentum. Some historians include the Greek colonies of Sicily in Magna Græcia.

Magnesia (AD MÆANDRUM), a city of Ionia (though not included in the Ionic League), in Asia Minor, near the Mæander, and ten miles N.E. of Miletus. The city was wealthy and prosperous till it fell into the hands of the Romans. Themistocles died here in 449 B.C. A temple of Artemis which existed here is said to have excelled that of Ephesus, and excavations show it to have been of great importance. Another Magnesia was a city of Lydia, on the S. bank of the Hermus. Here in 190 B.C. Antiochus the Great was defeated by Scipio Asiaticus, but the city flourished through Roman times and later. From this city we are said to get the words magnesia, magnesium, and magnet.

Magnesia, a light white powder which consists chemically of the oxide of magnesium, MgO.

It is tasteless and almost completely insoluble in water. It is formed when magnesium burns in air, but is usually prepared by strongly heating the carbonate of magnesium. Magnesia, free or combined with acids, is used considerably in medicine.

Magnesite, the mineral carbonate of magnesium (MgCO_3), usually occurs in a fibrous or reniform massive condition, but also crystalline, being isomorphous with calcite (q.v.), and dolomite (q.v.). It is generally white or yellowish, vitreous or silky, and subtranslucent or opaque. Its hardness is 3.5, and its specific gravity 2.8 to 3. It dissolves in warm hydrochloric acid with very little effervescence. It is used in the manufacture of Epsom salts, but is not an abundant mineral. It occurs, associated with serpentine, in the Tyrol, in Norway, and in various parts of the United States.

Magnesium, a metallic element which, though it is not found naturally in the free state, occurs very plentifully combined with other elements. Some of the more common compounds are *magnesite*, the carbonate MgCO_3 ; *dolomite*, a double carbonate of calcium and magnesium $(\text{MgCo})\text{CO}_3$; *kieserite* and *Epsomite*, sulphates of magnesium; *Carnallite*, a chloride of magnesium and potassium; *asbestos*, *meerschaum*, *talc*, *tourmaline*, and many other mixed silicates. The well-known Epsomite or Epsom salts (q.v.) were first found at the close of the 17th century, and were valued for their medicinal properties, while a little later other pharmaceutical preparations of magnesium compounds were in use. Black showed these were all compounds of a distinct metal, afterwards called magnesium, which was first isolated by Sir Humphry Davy. It is now prepared by heating magnesium chloride, fluorspar, and metallic sodium in closed crucibles, the crude metal being afterwards purified by distillation, then melted and cast in ingots, or drawn into wire, ribbon, etc. It is a silver white metal, which tarnishes in moist air. It is insoluble in water, but dissolves in acids. It is very light, possessing the specific gravity 1.75, is designated by the symbol *Mg*, and has the atomic weight 24. If heated in air, as by a gas or candle flame, it takes fire and burns with a bright white light, forming the monoxide MgO . This light is extremely rich in actinic or chemically active rays [ACTINISM], and hence is well adapted for the photography of dark interiors, as churches, caverns, etc. The salts of magnesium are of a white colour, and are mostly soluble in water. The oxide, carbonates, and phosphate, are insoluble, and in one of these forms, or as a double phosphate with ammonia, the element is estimated quantitatively. A hydrated carbonate formed by precipitating Epsom salts with sodium carbonate was formerly largely employed medicinally under the name of *magnesia alba*, while many other compounds of the metal, e.g. oxide, carbonate, sulphate, citrate, are still employed in medicine as antacids, mild purgatives, and aperients.

Magnetic Pyrites is a naturally occurring sulphide of iron with composition somewhat variable

but corresponding approximately with the formula Fe_7S_8 . It occurs as a bright brassy mineral (specific gravity 4.5), which occurs massive or crystallised in rhombohedra, and possesses magnetic properties which are, however, not as marked as those of the magnetic oxide. It frequently contains nickel, and is occasionally used as a source of this metal.

Magnetism (*magnes*, "the lodestone") is a special condition of a body, readily recognised by well-known properties. Those bodies that exhibit such properties are termed magnetic, and are best exemplified in iron and steel. The earliest observations were made on natural magnets of lodestone, and from remote periods. One practically important property of a magnet was known, that if suspended horizontally by a fibre or on a float it would turn into a definite direction and point approximately to the geographical north and south. Magnetism may be induced in a magnetic substance by simply placing it in the neighbourhood of a magnet, the surrounding medium evidently being in a condition different from that which obtains when no magnet is near. Moreover, the presence of a highly magnetic substance in a medium in such a condition, renders it more difficult to magnetise a less magnetic substance by simply placing it in the same neighbourhood. In fact, magnetism may be treated quantitatively, and any increase in the intensity of a portion of the magnetic field as the magnetised medium is called, due simply to the introduction of magnetic matter, is accompanied by a decrease in another portion. The magnetised state is dual; there are two different conditions in the one magnet. If the substance is in the form of a bar, and the whole length of this has been treated as uniformly as possible in the production of the magnet, the two ends will exhibit opposite effects, the end that points towards the geographical north being called the north pole, and the other end the south pole. It will be found experimentally that the north pole will attract the south pole of any other magnet, but will repel its north pole. The south pole, on the other hand, will attract north and repel south. Like poles thus repel each other, and unlike poles attract each other. If a north pole of a magnet be remote from its south pole, its north will be found, when placed in the neighbourhood of another magnet, to travel away from the north or towards the south of the second. Also it is found that the attraction in the one case and repulsion in the other is proportional to the inverse square of the distance between the two poles. The strength of a magnetic pole is usually measured by determining its force of attraction or repulsion on a known pole at a known distance, the force at a definite distance being proportional to the product of the strengths of the two poles. A bar of steel may be magnetised by rubbing one pole of a magnet along its whole length several times, providing that the bar is only rubbed in one direction. Any reversal of the direction of rubbing neutralises part of the magnetisation. A more effective method is to start at the middle with two unlike poles of two magnets

and rub the bar in opposite directions. Steel possesses the property of retaining the magnetic condition after the magnetising force is withdrawn. Careless handling may partially destroy the magnetisation; violent heating will do so entirely. The theory that magnetisation involves a rearrangement of the particles of the substance is supported by the facts that magnetisation of a bar is accompanied by change of volume, that rapid alternations of its magnetism cause a distinct humming sound, and that the *retentivity* of a substance for magnetism or its reluctance to part with it varies with its composition. Wrought-iron is much more easily magnetised when placed in a magnetic field, but much more easily demagnetised when removed from it. The power of a substance for concentrating magnetism within itself is termed its *permeability*, and wrought-iron is by far the most powerful substance in this respect. Most substances—bismuth, for example—are less capable of retaining magnetism than the surrounding air medium. The bismuth will appear to be repelled by a magnet, and will assume a position at right angles to the direction assumed by a magnetic needle. Such substances are termed *diamagnetic*.

The most powerful means of inducing magnetism in a substance is by means of an electric current flowing round a coil of wire. This is due to the fact that such an electric current affects the medium in exactly the same way as a magnet, and any bar with great permeability, placed in the neighbourhood of an electric circuit, is magnetised immediately. The most effective arrangement is to have a bar of very soft and pure iron acting as a core to the bobbin round which the wire is wrapped that conveys the current. The effect is *nil* if the current is alternating. With the usual convention concerning the direction of flow of the current, which assumes its passage to be along the wire from the copper (or corresponding portion of the battery) to the zinc, it is found that if the bar is viewed end-on, so that the current appears to be going in a clockwise direction, the near end of the bar is made a south pole, and the more remote end a north pole. If the bar is absent the electric circuit still behaves as a magnet, but not so powerfully, and any two such circuits will attract or repel each other according to the same rules as apply with ordinary magnets.

The behaviour of the magnetic needle in pointing towards the north and south is explained by the theory that the earth itself is a magnet, somewhat irregularly magnetised, with its poles near the geographical poles. If a needle is balanced horizontally before being magnetised, it will, when rendered magnetic, tend to point in the direction of the resultant magnetic force. Thus in English latitudes it points downwards, the angle of inclination being called the *dip*. At the magnetic poles the dip is 90°. Isoclinic lines (q.v.) on charts of the surface of the earth mark those places where the dip has the same value. The vertical plane in which the needle tends to place itself is not usually a geographical meridian. In England, for example, the needle points about 20° west of north. Isogonic lines (q.v.) show those places where the declination

from the geographical meridian has the same value. The facts mentioned above concerning the mutual actions of magnets on electric circuits or of circuits on circuits form the experimental basis of electromagnetism, by which may be explained the nature and action of dynamo-electric machinery. Modern electromagnetic theory deals particularly with the medium surrounding a magnet or an electric circuit, and suggests that not only are the stresses alike that are produced in the medium by either cause, but that they are identical in character with those that accompany the transmission of light through the medium. Electromagnetic disturbances, produced, for example, by an alternating current of high frequency in a neighbouring conductor, are transmitted through the medium at the same speed as light. This idea resulted initially from theoretical considerations of Clerk-Maxwell, but it has more recently received much support from experimental research of Hertz, who has made observations on the reflection and refraction of electromagnetic waves, which show that they are precisely similar in this respect to light-waves.

Magnetism, ANIMAL. [ANIMAL MAGNETISM.]

Magnetite, or LODESTONE (q.v.) (Fe_3O_4), a black oxide of iron strongly attractable by a magnet.

Magnetometer is an instrument for measuring magnetic forces. It is used to record the changes in the intensity of the earth's magnetism. One form consists of a bar magnet suspended by two equal threads which would naturally hang in a vertical plane. The magnet, however, causes them to twist out of that plane, and as the intensity of the earth's magnetic force alters from time to time the magnet takes up a new position. This instrument is known as the bifilar magnetometer. It is usually provided with a small mirror, which reflects a beam of light, and is thus enabled to photograph its own movements.

Magnolia, a genus comprising some twenty trees or shrubs, named after Pierre Magnol, professor at Montpellier in the 17th and 18th centuries, and giving its name to the thalamifloral order Magnoliaceæ. They have scattered, entire, leathery leaves, generally large, with large deciduous stipules, and themselves either evergreen or deciduous. The large, terminal flowers are white, pink, or purple, and often fragrant. They have three sepals, six, nine, or twelve petals in whorls of three, indefinite stamens and carpels, arranged spirally, the latter forming follicles from which, when split, the ripe seeds hang by remarkably long funicles. They are natives of North America, Mexico, Japan, China, and the Himalayas. *M. acuminata*, the cucumber-tree; *M. tripetala*, the umbrella-tree; *M. glauca*, the swamp sassafras or beaver-tree, and the favourite *M. grandiflora*, were introduced from North America, mostly in the last century. *M. conspicua*, from Japan and China, flowers before producing its leaves, as also does the most magnificent *M. campbelli* of Sikkim and Darjiling, which reaches 80 feet in height and 12 feet in girth, with white or pink flowers 10 inches across.

Magomi, one of the chief nations of Bornu, Central Sudan, who arrived in the 13th and 14th centuries from the north (probably the Tibesti highlands, Central Sahara), gradually reduced a great part of the country, and gave many kings to Bornu. They are scattered in small groups over most of this region, though their chief seat is the city of Magommeri in the heart of the country. The Magomi are a Negroid people of somewhat coarse type, closely related to the Kanuri, the present ruling race, speak the same language, and, like them, have long been Mohammedans.

Magpie, any bird of the Corvine genus *Pica*, with nine species, from the Palæarctic region, Arctic America, and California. The bill is entire, with cutting edges, and has at its base bristles directed forward; the tail is very long and graduated. *P. rustica*, the Common Magpie, with nearly the range of the genus, is a common, but very beautiful, British bird about 16 inches long, with black



MAGPIE (*Pica rustica*).

plumage glossed with brilliant metallic reflections; the scapulars and under surface are white, as are the primaries, except for their black tips. These birds are mischievous and predatory, doing great damage to the poultry yard, and to the eggs and young of feathered game, so that farmers and keepers unite to thin their numbers. They feed also on mice, frogs, molluscs, and worms. The large dome-shaped nest is lined with soft grass, and surrounded with stout thorns to keep away intruders. The eggs are pale bluish-white, with brown spots, and the number varies from six to eight. The magpie readily adapts itself to life in a cage, and soon learns to articulate words; but, whether tame or wild, it is a terrible thief, and will carry off and hide any bright glittering object that falls in its way. Magpies are generally considered birds of ill omen, and figure largely in European folk-lore.

Magpie Moth (*Urapteryx sambucaria*, Linn.) is the largest of the British Geometers (q.v.), of which group of moths it is a very convenient type, as it is so very abundant in gardens. The larvæ feed on fruit trees. The colour of the moth is white, and it has a variable series of yellow bands and black blotches.

Magwamba (MAKWAPA, BA-TONGA), a Bantu people of south-east Africa, on the coastlands

between Delagoa Bay and Sofala, and stretching along both banks of the Limpopo inland to North Transvaal; they have branches even as far north as Nyassaland, where the Ba-Tonga of the Bandawé district speak a Si-Gwamba dialect, which has been reduced to writing by the missionaries. But most of the nation are still ancestry-worshippers, degraded by contact with the whites, addicted to hemp-smoking and drink, and in the Transvaal practically serfs of the Boers. (Berthoud, *The Gwamba Language*, in the *Journal of the Royal Asiatic Society*, xvi., Part I.).

Magyars, a historical people either of Finno-Ugrian or (more probably) of Finno-Turki stock, who, after a long sojourn on the South Russian steppes, were driven west by the Khazars, crossed the Carpathians, and entered Pannonia (Hungary) in the 9th century, where they have since been the dominant race. For three hundred years they were the terror of all the surrounding nations, extending their predatory excursions over Central Europe as far west as France, and south-west to the Adriatic, where they secured a permanent footing in north Dalmatia. But in the 13th century they embraced Christianity under King Stephen, and later became an eastern bulwark of Christendom against the invasions of the Osmanli Turks. The Magyars hold a peculiar position in ethnology, their primitive Finno-Tatar physical type having been for the most part assimilated by continuous crossings to the normal European (Caucasic), while they have preserved intact their national speech, which appears on the whole to be more nearly allied to the Turki than to the Finnic branch of the Finno-Tatar linguistic family. They have also in all essentials mainly conformed to the general standard of European culture, although still betraying their original nomad instincts in their great love of horsemanship, their preference for the Danubian plains over the surrounding mountains, and for pastoral over strictly agricultural pursuits. Although a large proportion are Roman Catholics, it is noteworthy that they have always shown a singular regard for the English, who are welcomed in their homes more as brothers than strangers. This is, perhaps, in some measure due to the unpopularity of Russia, which is regarded as England's rival in the East. Calculated on the basis of language, the Magyar nation numbered at the last census (1880) 6,479,000 persons; but many of Magyar speech are certainly not originally of Magyar stock, for the language, owing to political influences, has spread (and continues to spread) amongst the surrounding Slav and Germanic populations, the increase since 1869 (5,541,000) being estimated in 1892 at over 1,500,000 (7,000,000). They form the great bulk of the population on all the lowlands of Hungary proper, and are also numerous in Transylvania, where they are known as *Szekely* ("Borderers"), in reference to their advanced position towards the former frontiers of Turkey. As a race, the present Magyars may be called handsome in the European sense, with regular features, shapely pliant figure, of medium height, graceful carriage, and fair muscular development, though this picture applies rather to

the nobles and upper classes than to the peasantry, whose features are often extremely coarse and even of pronounced Mongolic type. The Magyars are a brave and chivalrous people, frank and generous, fond of display and extravagant, which often makes them a prey to the Jewish money-lenders, into whose hands many of their ancestral lands have already passed, or to whom they are heavily mortgaged.

Mahábhārata ("THE GREAT HISTORY OF THE DESCENDANTS OF BHARATA"), one of the two great Sanskrit epics, containing over 100,000 couplets. The story of the struggle between the Kauravas and the Pándavas, which forms the main theme, probably rests on a basis of historical fact. These two families were the sons of two brothers, Dhritaráshtira and Pándu, descendants of Bharata. The Pándavas, supposed to be incarnations of certain deities, were ultimately victorious. In consequence of the numerous episodes dealing with mythology, cosmogony, religion, law, and philosophy, the book came to be regarded as a cyclopædia of ancient Hindu learning. According to tradition, it was written by Vyása; but, as this name means "arranger," the work is evidently a compilation.

Mahanadi, a river of the Central Provinces of India, rising in the wild region, 20 miles S. of Raipur, and having an easterly course of 520 miles to Cuttack, passing through the Eastern Ghâts by a gorge 40 miles long. At Cuttack, which is the head of the delta of Orissa, the river divides and flows E. and S.E. A great quantity of flood water is brought down by the river, and this water is much utilised by means of canals for irrigation purposes.

Mahdi (Arabic "directed one," hence "director," "guide"), a divinely-inspired teacher or ruler to whose appearance Moslems look forward as the Jews do to that of the Messiah. His advent on earth is said to have been foretold by the prophet himself. The Shiah sect of Mohammedans, who recognise only the kalifs that were lineally descended from the prophet, maintain that the Mahdi has appeared already in the person of Mohammed Abu'l Qāsim (868-79), the twelfth Imām (a term corresponding to the Sunnite kalif), and that he is now concealed but will return before the end of the world. Their opponents, the Sunnis, believe that no Mahdi has as yet appeared. Of the numerous pretenders who have claimed to be the Mahdi, the most recent was Mohammed Ahmed (1843-85), a native of Dongola, who established himself at El-Obeyd, in Kordofan, and excited the Soudanese insurrection.

Mahogany (*Swietenia Mahagoni*), a large tree belonging to the order Meliaceæ, native to Mexico, Central America, and the West Indies, and yielding one of the most generally used of cabinet woods. The leaves resemble those of the ash: the flowers are clustered and small, with their parts in whorls of five, and ten united stamens; and the fruit is a pear-shaped woody capsule with winged seeds. The bark has febrifuge properties and the wood is a rich reddish-brown, often richly mottled, uniform in grain, susceptible of the highest polish, and very

durable if not exposed to marine boring molluscs. In Mexico the timber is sometimes in 30 feet lengths and 48 inches square. Mahogany is commonly divided into *Spanish*, the darker, heavier and more figured, from San Domingo and Cuba, and *Honduras*, lighter, softer, and plainer, from the mainland. Though noticed during Raleigh's expedition in 1595, it was only introduced in the last century. It is employed in carving, turning, veneering, and cabinet-making, and for solid furniture, and is classed as second-class in Lloyd's ship-building list. We import about 40,000 tons annually, about half from Mexico and the rest from Honduras, Jamaica, and the other islands.

Mahomet. [MOHAMMED.]

Mahony, FRANCIS (FATHER PROUT) (1804-1866), priest, scholar, journalist, and poet, was born in Cork, educated in Amiens and Paris. Having been ordained, he served in Switzerland and Ireland, and then was appointed to duty in London. In 1834 he became connected with *Fraser's Magazine*. He was noted for his elegant translations from English into Latin, French, Greek and Italian verse, and also from French, Latin and Italian into English. In 1846 he became *Daily News* correspondent at Rome, and for the last few years of his life wrote letters from Paris for the *Globe*. His *Bells of Shandon*, *Mistletoe*, *Lady of Lee*, *Legend of Arethusa*, are much admired, and he possessed a deep though quiet fund of humour. His *Reliques* were published in 1836 and 1860, and his *Final Reliques* in 1876.

Mahratas (MAHARATAS), a historic people of west Central India who, because of their Aryan (Neo-Sanskritic) language, are usually regarded as Aryans, but who are rather originally of Dravidian stock, modified by Kolarian and Aryan elements, and Aryanised in speech, religion, and general culture. From remote time the term *Maharata* was applied to all the Hindu castes of the region, which was the *Maha-Rashtra* ("Great Kingdom") of the early writers, and which extended from the river Tapti southwards to the upper course of the Kistna and eastwards to the frontiers of the present territory of the Nizam. Now, however, the term is limited to the *Kumbi*, that is, the agricultural Sudras who in the 18th century rose under Sivaji against the Mussulman rule of the Great Moghul, and overran India with their military and plundering expeditions. The Mahratas still belong essentially to the Sudra caste, showing that they were not originally Aryans, as is also evident from their almost Mongoloid type—rather low stature, somewhat flat features, small nose, wide nostrils, small black eyes, long jet black hair, dark yellow or bronze complexion, but much lighter in the women. The language, which seems more akin to the Sauraseni and Magadhi than to the Maharashtra Prakit, is highly cultivated, and spoken in about eight dialects by over 12,000,000, mainly Hindus by religion.

Maī, ANGELO, CARDINAL (1782-1854), an Italian scholar, was born in Lombardy and educated at a Jesuit college. Having been appointed to a cure

at Milan, he became librarian there, and made valuable discoveries among the MSS. of the library, among other things, palimpsests of Cicero and Plautus, and publishing in 1822 a valuable edition of the *De Republicâ*. Invited to the Vatican, he took charge of the library, and in spite of the calls made upon him by his ecclesiastical rank and dignities, he worked hard among the unedited MSS. there, and did much to advance the cause of learning.

Maiden-hair, the popular name of the species of *Adiantum* (q.v.) and some other ferns having slender black leaf-stalks. The rare British species *Adiantum Capillus-Veneris*, *A. euneatum*, the large-leaved *A. farleyense*, and the tiny-leaved *A. graeilinum* are commonly cultivated in greenhouses and largely used in bouquets. *Asplenium Adiantum-nigrum*, the black maiden-hair spleenwort, and *A. Trichomanes*, the English maiden-hair, are common British ferns.

Maidstone, municipal and parliamentary borough (1 member), county and assize town of Kent, 41 miles from London, and half-way between London and Dover, is situated in a valley, chiefly on the E. bank of the navigable Medway, which is crossed near the railway station by a stone bridge, rebuilt in 1879. The Flemish introduced here the broadcloth trade and the manufacture of linen thread, but these have passed away, and the chief industries are now brewing and paper-making. The town is the centre of a rich hop district. The grammar school was founded in 1549, and there are charities to the amount of £3,000. The church of All Saints—one of the largest parish churches in England—was built in place of St. Mary's, demolished by Archbishop Courtenay in 1395, and contains sedilia, and the carved oak seats of the collegiate priests, the interesting ruins of whose college, founded by Archbishop Courtenay, are near by. The Archbishops lived here, but the present palace is Elizabethan. Among places of interest are the museum and library—established (1859) in the ancient Chillington House, itself an interesting relic—the town hall, the county gaol (built of ragstone from the neighbouring quarries, renowned for the valuable fossils found there), and the barracks.

Maigre (*Sciæna aquila*), a food-fish of the type-genus (with about 50 species, some from freshwater) of the acanthopterygian family Sciænidae. It is common in the Mediterranean, and sometimes strays to Britain. Specimens six feet in length are recorded, but the general size is much less.

Maidun, an ancient Irish hero, whose exploits are dealt with by Dr. Joyce in his *Ancient Celtic Romances* (1879). He was born in County Clare, and, his father having been killed by pirates, he set out on a three years' voyage in search of the slayers of his father. After a set of most marvellous adventures, he found and forgave the murderers.

Maimon, SOLOMON (1754–1800), a philosopher, was born in Russia. He studied the Talmud, and was trained for a rabbi. Having made the acquaintance of the system of Maimonides, he went

to Berlin, where he studied philosophy, science, and languages. His life was aimless and poverty-stricken, and he wrote little, his chief works being *Versuch einer Transcendentalen Philosophie* (1790), and an *Autobiography* (1792).

Maimonides (1135–1204), a Jewish philosopher, born at Cordova. He became a rabbi, and practised medicine, becoming the author of several medical works, and being appointed court physician to Saladin of Egypt. He studied deeply Greek and Arabian philosophy, and wrote upon logic. Astronomy also and mathematics occupied his attention; but his great claim to fame is that he was one of the greatest of Jewish Talmudists and theologians. His codification of Jewish law (composed in Hebrew), called the *Mishneh Torah*, is still highly thought of and much used, and his *Guide of the Perplexed* (composed in Arabic) has a great reputation.

Main, river in Germany, is formed by the White Main, rising in the Fichtelgebirge at a height of 2,900 feet, and the Red Main, rising a few miles from Bayreuth; these two uniting 4 miles below Kulmbach in Bavaria, and flowing with an irregular westerly course of 300 miles, for 200 of which it is navigable, passing many important towns—Frankfort among them—and joining the Rhine opposite Mainz. It flows through a fertile country abounding in vineyards, and receives the waters of the Saale and Regnitz. By means of the Altmühl and Ludwig's Canal it is connected with the Danube.

Maine, the most north-easterly of the United States, situated between lat. 43° and 47° N., and between long. 67° and 71° W., having New Brunswick to the E. and N., and New Hampshire S.W. and the Atlantic S.E. It is 302 miles long by 285 miles broad, and its 225 miles of direct coast-line are increased to 2,500 miles by deep indentations, whence its designation as “hundred-harboured Maine,” while the coast is fringed with islands. The watershed crosses from E. to W. at about 140 miles from the coast, and the rivers have generally a N.N.E. or S.S.E. direction. These rise at a considerable height—e.g. the Kennebec (2,000 feet), Androscoggin (3,000 feet), Penobscot (2,500 feet), St. John (1,980), and Saco (1,890), and the great falls, with the storage of water provided by a system of lakes which form a characteristic feature of the state, give an immense power not yet greatly utilised; and the principal falls, being in the lower courses, are no impediment to navigation. These lakes number 1,570, and occupy one-fifteenth of the state, the largest being Moosehead, on the Kennebec river (35 × 10 miles), and many of the most picturesque are in unsettled districts. The Appalachians stop short of the state, and the undulating surface is dotted with conical well-wooded peaks. The rocks are metamorphic, and there is plenty of granite, felspar, quartz, and the like. A very pure surface iron is found, and is worked at the Katahdin iron-works, and slate, marble, limestone, silver, and copper are other productions. The soil is glacial, and the fossils are of an Arctic nature, while the animal

world partakes of N. and S., and fish are abundant. The picturesque lake scenery and the climate, which has a summer average of 62·5°, attract multitudes of tourists. Many of the pines which gave it the name of "Pine-tree State" have been cleared off. Augusta is the state capital, while Portland is the largest town and principal sea-port. The chief industries are cotton and woollen manufacture, tanning, boot- and shoe-making, iron-working, lumbering, and fish-canning, and some wooden ship-building. Ice is largely exported. The remnants of two Indian tribes still linger in the state. The law prohibiting the sale of liquor is in force in this state.

Maine, HENRY JAMES SUMNER, SIR (1822–88), was educated at Christ's Hospital and Pembroke College, Cambridge, gaining the Craven Scholarship and the Chancellor's Medal, and being Senior Classic and a Senior Optime. After being elected fellow and tutor of Trinity Hall, he was appointed (1847) Regius Professor of Civil Law. In 1850 he was called to the bar, and in 1854 became reader in jurisprudence at the Middle Temple. In 1862 he went to India as member of the Law Council, and 1870 became professor of Comparative Jurisprudence at Oxford. In 1871 he was on the Council of the Secretary for India, and was made K.C.S.I., in 1877 he became Master of Trinity Hall, and in 1887 Whewell Professor of International Law. He is best known generally for his valuable contributions to the knowledge of early societies, his most noted works being *Ancient Law* (1861), *Village Communities* (1871), and *Early Law and Custom* (1883).

Maintenance, IN LAW, interference in a suit by an uninterested party, with a view to maintaining the litigation. It is a punishable offence. [CHAMPARTY.]

Maintenance, CAP OF, in heraldry, a cap of dignity, originally borne before English sovereigns at their coronation, used in blazonry as the supporter of the crest (at first of noble personages only) in place of a crown, coronet, or wreath. The name is also given to a cap borne on state occasions before the mayors of certain cities.

Maintenon, FRANÇOISE D'AUBIGNÉ, MARQUISE DE (1635–1719), mistress and second wife of Louis XIV., was the daughter of a persecuted Huguenot. After a time in Martinique, Françoise returned to her country, and was converted to Protestantism, being re-converted at the instigation of the king. Falling again into neglect, she married Scarron in 1651, and was thus introduced into the most brilliant society of the time. Scarron died, and after Anne of Austria's death the king would not continue the pension allowed to Scarron's widow. However, Madame de Montespan interested herself on Madame Scarron's behalf, and committed to her the care of the king's children. She came to court, took the king's fancy, and finally took Madame de Montespan's place, finding favour generally, even with the queen, and eventually marrying the king. Her political influence was great, and her *Letters* show talent, and throw light upon the Court intrigues of the time.

Mainz, or MAYENCE (Moguntia), a strong fortress, formerly a free city, now the largest town of the Grand Duchy of Hesse-Darmstadt, is on the left bank of the Rhine, nearly opposite the entrance of the Main. A stone bridge in place of the former bridge of boats and a railway-bridge connect it with Kastel on the opposite bank. Some of the streets are narrow and irregular, but much of the old town was destroyed by an explosion in 1857, and was rebuilt in a better style. There is a good street near the river, and a fine embankment 4 miles long, and 300 feet wide, and to the S. is a park. The commerce, which had decayed, has now revived. New harbour works have been executed, and Mainz is now, besides being a great railway centre, one of the chief seats of the Rhine trade. The chief articles of trade are wine, grain, timber, flour, and oil, and among the industries are the manufacture of leather, furniture, carriages, chemicals, and carpets. The old cathedral of the 12th, 13th, and 14th centuries, restored by Napoleon in 1814, and further restored 1870, has six towers, one of which is nearly 300 feet high. It contains the tomb of Archbishop Boniface. There are other churches of note, a palace of the Grand Dukes, the old Electoral Palace (now a museum, etc.), a theatre, the arsenal, statues of Gutenberg (who here invented printing) and Schiller, and two fountains. Among the Roman remains is the Igelstein, supposed to have been erected to the son-in-law of Augustus (Drusus), who had here a *castrum*, and a *castellum* (Kastel). In the 3rd century the Bishop of Mainz became Archbishop and Primate of Germany. In later times he was head of the electors who appointed the emperors. It became a German fortress in 1871.

Maistre, (1) JOSEPH DE (1754–1821), diplomatist and polemical writer, was born at Chambéry, and studied at Turin. He entered the Civil Service under the House of Savoy, and became a member of the Senate. The Revolution drove him to Lausanne, and there in 1796 he wrote *Considérations sur la France*. He was afterwards summoned to Turin, and later to Sardinia, and was in 1802 sent as envoy to St. Petersburg. In 1815 he returned to Savoy and to high office. His polemical works, *Du Pape*, and *Letters on the Inquisition*, were of an Ultramontane character. He also wrote *Soirées de St. Petersbourg*, and an examination of Bacon's philosophy. (2) XAVIER DE, brother of the above, was born at Chambéry, and for a time served in the Piedmontese army. During this time he wrote *Autour de ma Chambre*. Afterwards he went to St. Petersburg, and became to all intents and purposes a Russian. Other well-known works of his are *Le Lépreux de la Cité d'Aoste* and *La jeune Sibérienne*.

Maithili, a Neo-Sanskritic language intermediate between Hindi and Bengali, spoken in North Berar and the Terai district, South Nepal, by about 10,000,000; written in the Devanagari, Bengali, and Kayathi characters indifferently; chief varieties: Chapra, Bhagalpuri, Madhubani; grammar by G. G. Grierson (Calcutta, 1881).

Maitland, JOHN. [LAUDERDALE.]

Maitland, SIR RICHARD (1496–1586), lawyer and poet, was the son of a Maitland who fell at Flodden. Educated at St. Andrews and in France he became in 1552 a border-commissioner, and soon after a Lord of the Session, and from 1562 to 1567 he was Lord Privy Seal. He remained on the bench till the age of 88. Besides poems, chiefly satirical, he wrote a *History of the House of Seyton*.

Maitland, WILLIAM (1525–73), son of Sir Richard, and better known as LETHINGTON from the name of his estate. He was made Secretary of State by Mary of Guise, but his views were too much in favour of the reformers to enable him to retain the office. He entered into controversy with John Knox, and was sent to announce to Queen Elizabeth the marriage of the Queen of Scotland with Darnley. He was concerned in the murder of Rizzio and in that of Darnley, but was one of those who accused the queen of being privy to the latter. He fought against the queen at Langside, but afterwards espoused her cause, and, after being arrested by Murray for compassing the king's death, he helped to hold Edinburgh for her, together with Kirkcaldy of Grange. Upon the surrender the latter was executed, and Lethington died (it is thought by his own hand) in prison.

Maize, or INDIAN CORN (*Zea Mays*), a cereal grass, unknown in a wild state, but probably indigenous to tropical America. It is found in ancient Peruvian tombs; but seems to have been cultivated in Java and other equatorial Pacific islands from ancient times, and introduced thence into China, India, and Turkey, so that Gerard, in 1597, describes it as "Turkey corn," and in Germany it is to this day called "Türken." At the discovery of America it was found in cultivation throughout the two continents, and there are now more than 300 varieties known. It prefers a deep, rich, warm soil, such as that of the Mississippi basin; but on comparatively poor sandy soil will yield a crop where clover and lucerne will not. Intolerant of frost, or even of cold nights, it is in England almost exclusively useful as green fodder, of which it will yield from 50,000 to 80,000 lbs. per acre. Being very sweet, the stems are much relished by sheep and cattle. In the western prairies it is even grown for fuel. The plant is monoëcious, producing its staminate or male flowers in a large feather-like cluster at its summit, and the *cobs* or dense spikes of female flowers ending in pendulous, pink, silk-like tassels of long stigmas in the axils of lower leaves. The sheaths of the leaves are used in packing oranges and cigarettes. The grains may be white, yellow, purple, red, or striped, and differ considerably in composition. The hard *flint* varieties are known as *pop-corn*, because when roasted the skin bursts and the meal swells. The *sweet* varieties are largely eaten unripe as *green corn* in America. Maize is very nutritious, being richer in albuminoid matter than any other cereal, and, being also richer in oil, it has great fattening value; but it does not by itself make good bread. In Spain and Portugal it is mixed

with rye meal for this purpose. When deprived of its gluten it constitutes *corn-flour*, *corn-starch*, *oswego*, or *maizena*. Besides its use on an enormous scale for food, maize is being more and more employed in distillation and in the manufacture of starch and glucose. Besides its extensive cultivation in southern Europe, in India, and, under the name *mealies*, in South Africa, there are 70,000,000 acres under maize in North America, the annual produce of the United States amounting to 2,000 million bushels. Our import of maize is now about 2,250,000 tons annually.

Majolica (MAJORCA - WARE), so-called by Italians because the earliest specimens came from the island of Majorca. The term is applied to decorative pottery with a lustrous, enamelled surface, produced from the 15th to the 17th century, especially to the more highly-ornamented and vividly-coloured specimens made in Italy, Spain, and Majorca. Modern majolica, generally made in large pieces, offers a rough imitation as to colour and lustre of the pottery properly entitled to the name.

Major (military), the title of the lowest field-officer, next in rank above a captain and below a lieutenant-colonel. A major is often in command of a battalion, and, as the representative of his superior officer, of a regiment.

Major, JOHN (1470–1550), a theological writer, born near North Berwick. He was educated at Cambridge, and at Paris, where he graduated M.A. in 1496, and Doctor 1505, and where he lectured for some time. From 1518 to 1522 he was principal of Glasgow University, where John Knox attended his lectures, and then became principal of St. Andrews, where George Buchanan was his pupil. At his death he was head of St. Salvator's.

Majorca, the largest of the Balearic Isles, is 100 miles from the Spanish coast, and 150 from Algiers. It is 60 miles long by 40 wide, and contains 1,310 square miles. The climate is salubrious by reason of the sea-breeze. The island is very productive of olive, almond, fig, and other fruits, and makes good wine. The chief industries are the manufacture of cotton, cloth, silk, shoes, and rope, and there is a large trade with Spain. A railway leads from the capital, Palma, to Manacor and La Puebla. Near Manacor are some noted caves, and near Alfudia, which is the port for Spain, were marshes which have been drained and cultivated.

Majority, the period of anyone's full age (which is 21 years). A minor comes of age in the eye of the law on the day preceding the anniversary of his birth.

Makalaka, a Bantu people of Bechuana stock, chiefly in the region north of the Limpopo, where they have long been oppressed by the Matabeles. Some have migrated northwards to the Zambesi above the Victoria Falls, and to the Bamangwato territory on the shores of Lake Ngami.

Makaraka (MAKRAKA), a large Negro nation, easternmost branch of the Niam-Niams, who migrated some sixty years ago from the Welle to their present seats in the basin of the Yei tributary

of the White Nile. They call themselves *Iddio*, the term Makaraka, *i.e.* "Cannibals," being applied to them by their neighbours; but although really addicted to this practice, they are in all other respects far superior to all the surrounding Nilotic peoples. They are excellent agriculturists, and before the Mahdist outbreak were largely employed as soldiers and carriers in the Egyptian service. Junker gives them the highest character for honesty, courage, patience and endurance under the greatest hardships.

Makari (KOTOKO), a Negro people of Central Sudan, where they form the bulk of the southern provinces of Kotoko and Logon, in the kingdom of Bornu; they appear to have come originally from the middle Shari basin, exterminating or absorbing the Keribina and other aborigines of their present domain. The Makari are mostly Mohammedans, and their Sultan of Logon often takes part in the slave-hunting expeditions organised by his paramount lord, the king of Bornu, against the surrounding Musgo and other more southerly pagan populations.

Makololo, a renowned people of Basuto origin, who, after their expulsion from Kuruman by the Griquas (1824), were led by their chief Sebituane across Bechuanaland northwards to the middle Zambesi, incorporating in the military caste all the young bloods of the nations conquered by them on their long wanderings of 800 or 900 miles from the south. On the Zambesi Sebituane overthrew the dominant Barotse people, and founded the so-called Makololo Empire, which after his death in 1851 passed to his young and feeble son Sekelutu. During his reign of thirteen years (1851-64) the Makololos were greatly reduced by incessant wars, so that on his demise the Barotse rose against their conquerors, exterminating them almost to a man, and restoring the Barotse state, which has recently accepted the British protectorate (1892); but a handful of Makololos had previously descended the Zambesi to the Shiré outlet of Lake Nyassa, where the terror of their name enabled them to set up a few petty states in the midst of the Manganja populations. These also, after for many years tyrannising over the natives, have been reduced to order, and are at present loyal subjects of the British authorities in Nyassaland. Of Sebituane's vast empire nothing survives except the Se-Kololo language, a corrupt form of Se-Suto, still current amongst the Zambesi tribes subject to his rule. (Livingstone, *Travels*; Holub, *Sieben Jahre in Süd-Afrika*, 1881; Serpa Pinto, *How I Crossed Africa*, 1881.)

Makua, a large Bantu nation, East Central Africa, whose domain extends from the Mozambique coast inland to the Lujende river, and from the Rovuma southwards nearly to the Zambesi delta. But although numerous and powerful, the Makuas have never developed a large state, and even within their territory several other peoples, such as the Mabilia, Medo, and Mawa, have succeeded in establishing themselves. The Makua women wear the hideous *pelele* lip "ornament," while the men, at

least on the coastland, are everywhere distinguished by a tattoo mark in form of a crescent incised on the forehead, concave side downwards. Although their territory lies within the Portuguese Mozambique possessions, the Makuas have never been subdued; but, on the contrary, have more than once driven the whites from the mainland. In 1881 their chief, Namaralo, after wasting the whole country east of Fernando Veloso Bay, raided right up to the very guns of the capital on Mozambique island. (Rev. Chauncy Maples, *Handbook of the Makua Language*; Consul O'Neill, *Proceedings of the Royal Geographical Society*, November, 1884.)

Malabar, a district of the Madras Presidency, situate upon the Arabian Sea, 145 miles long and varying in breadth from 25 miles in the N. to 70 in the S., and containing 5,760 square miles. The surface is diversified, and in the E. is traversed by the Western Ghâts, in which is an opening 25 miles across called the Palghat Gap. There are several rivers, and the country is well-wooded, and produces rice, cocoa-nuts, coffee, and pepper. Most of the population are Hindoos. The district gives its name to the neighbouring western coast of India.

Malacca. 1. A name sometimes applied to the Malay peninsula, which is attached to Further India by the isthmus of Kra. Sometimes it is taken to include the country as far as British Burma, from which it is separated by the Pakshan. Bounded on the E. by the Gulf of Siam and the China Sea, and the W. by the Bay of Bengal and the Malacca Strait, the country is well wooded, and is traversed by mountain ranges of considerable height. From the mountains the ground slopes to fertile plains, while on the coast are miles of mangrove swamps, and off the coast is a fringe of islands. The chief productions are tin, gold, silver, lead, ebony, sandalwood, and camphor; and coal and iron are found, but not worked. Rice, sugar, cotton, tobacco, cocoa-nuts, and areca-nuts are the chief objects of cultivation. The climate is not good for Europeans. The various divisions, Malacca, Singapore, etc., are separately treated.

2. A British settlement and town on the S.W. coast of the Malay peninsula, 100 miles from Singapore, having a length of 42 miles and a breadth varying from 8 to 25 miles, and an area of 659 square miles. Inland are low hills, but the coast districts are swampy, owing to their low level and the great rainfall. The chief products are tin, tapioca, rice, pepper, and fruits—tin and tapioca forming articles of export. The town is on a river of the same name, which divides the old Dutch town from the Malay and Chinese quarter, which is on the left bank. The trade once possessed by it has passed away to Penang and Singapore. Originally Portuguese, it has passed backwards and forwards between Holland and England till it finally became British in 1824.

Malacca, STRAITS OF, 480 miles long, with a breadth varying from 30 to 115 miles. separate the Malay peninsula from Sumatra, and join the Indian Ocean to the China Sea.

Malacca Cane, the stem of a slender palm, *Calamus Scipionum*, grown in Sumatra but imported from Singapore and Malacca, is much valued for walking-sticks. Some are a uniform rich brown colour, whilst others are mottled or *clouded*, the colour being produced artificially by smoking the cane.

Malachi, the name borne by one (traditionally the latest in date) of the Minor Prophets of the Old Testament, though it is doubtful whether the name refers to the man or the book. A Hebrew tradition identifies him with Ezra. The book is chiefly taken up with upbraiding the people for falling away from their national customs, and with advocating a return to Jehovah and the Deuteronomic Law.

Malachite, the mineral hydrated carbonate of copper, or carbonate and hydrate combined ($\text{CuCO}_3 + \text{CuH}_2\text{O}_2$). It is occasionally found in oblique crystals, but more usually in stalagmitic, reniform, mammillated, or earthy incrustations, obviously precipitated from solution, having originated by the weathering of native copper or some other copper-ore. It is sometimes fibrous and silky, or rather velvet-like, and presents a great variety of shades of green. Its hardness is between 3.5 and 4, and its density between 3.7 and 4, so that it is both harder and heavier than marble; but, though it takes an excellent polish, it is brittle. It dissolves with effervescence in acids, blackens, and gives off water when heated, colours the blow-pipe flame green, gives a green borax-bead, and can be reduced on charcoal to metallic copper. It occurs in most places where copper-ores occur, and is commonly associated with the allied *blue malachite*, *azurite*, or *chessylite* (q.v.). As it contains about 57 per cent. of copper, it is a valuable, as well as an easily-worked, ore of copper; but the finer varieties are more valuable for ornamental purposes, such as vases, snuff-boxes, brooches, inlaid tables, mantel-pieces, etc. These are obtained mainly in Siberia, especially at Nijni Tagilsk, Ekaterinburg, and at Burra-burra in South Australia.

Malachy, St. (*circa* 1094–1148), Archbishop of Armagh and Papal Legate, was ordained at 25, and at 30 was Bishop of Connor, after presiding over the monastery of Bangor. When Connor was sacked by the king of Ulster, Malachy founded a monastery in Munster. Celsus, Archbishop of Armagh, though the dignity was considered hereditary in his family, named Malachy as his successor; but the latter, when once he had put the see in order, gave it up in all but name. In 1139, on his way to Rome to seek the pallium, he visited St. Bernard at Clairvaux, and on the way home he brought back with him four Cistercians, who founded the monastery of Mellifont. In 1148 he went again to Clairvaux, and there he died. St. Bernard wrote his life.

Malacopterygii, in Cuvier's classification a division of Bony Fishes (q.v.) in which the rays of the dorsal fins were soft and jointed.

Malacostraca, the division which, with the *Entomostraca* (q.v.), forms the order Crustacea.

Malaga, a maritime district of Andalusia, in Spain, having Cadiz on the W., Granada on the E., the Mediterranean on the W., and containing 2,823 square miles. The land rises rapidly from the coast, and inland are several sierras, the loftiest being that of Alhama (7,000 feet), which separates the district from Granada. The chief river, the Guadalhorce, rises in the Alhama Sierra, and flows W. and S., falling into the sea near the town of Malaga. Another river is the Guadiaro. Lead, nickel, and iron are found, and at Carratraca are sulphuretted hydrogen springs. Much oil and wine are produced and exported, though the phylloxera has injured the wine trade, and the United States now go to California for most of their raisins instead of importing from Malaga. Other products are wheat, oranges, lemons, figs, almonds, and some sugar-cane. The capital (Malaga) is a seaport, 65 miles N.E. of Gibraltar, and has a harbour protected by two moles. The chief industries are the manufacture of cotton, linen, machinery, pottery, and wine, and oil-presses. It is also a great resort for invalids by reason of the dry, sunshiny, but temperate climate which is afforded by the shelter of the mountains. Originally founded by the Phoenicians, Malaga was Moorish till 1478, and a Moorish castle still exists.

Malagasy, collective name of all the inhabitants of Madagascar, who possess linguistic unity to a remarkable extent, combined with considerable physical and social diversity. The substratum of the population is certainly Negro, intermingled in varying degrees with an intruding Malay element, which has everywhere imposed its Malayo-Polynesian speech on the African aborigines. These Malays arrived apparently from the Eastern Archipelago in remote prehistoric times, and possibly in more than one stream of migration, the last comers being the now dominant Hovas of the central plateau, who have best preserved the original Malay type. [HOVAS.] This type is almost effaced amongst the Antankaranas, Betsimisarakas, Antaimoros, and other groups of the east coast, who are far more Negroid in appearance than the Sakalavas, Antifiherenanas, and Mahafalys of the west coast. There are also traces of contact with the Arabs; the Antaimaros even claim to have arrived from Mecca, and amongst them are still preserved some very old manuscripts written in Arabic characters. The Hovas and their southern neighbours, the Betsileos, have alone developed a fully-organised political system, and consequently amongst these European influences have made most progress in recent times. The Catholic, and especially the Protestant, missionaries have been very successful on the plateau, where thousands claim to be Christians, and where European arts and even letters are already widely diffused. But the eastern, the western, and the extreme southern groups are still in the tribal state and, for the most part, at a very low stage of culture. The mild disposition of the Malays, however, has had its effect upon these rude communities, so that nowhere in Madagascar are pagan rites associated with the sanguinary ordeals and other barbarous cruelties so

prevalent in African heathendom. The Malagasy language, spoken with slight dialectic diversity by all the tribes, is a member of the widespread Malayo-Polynesian family, showing close affinities not only with Malay, but also with the forms current amongst the Samoan, Maori, and other South Sea islanders. It has been reduced to writing by the missionaries, under whose control the press of Antananarivo has issued numerous religious and popular works.

Malagrida, GABRIEL (1689-1761), an Italian Jesuit missionary, was sent to Brazil, and on his return went to Portugal. Here he was convicted of complicity in a plot against the king's life, and was burnt alive by the Inquisition.

Malapterurus, a genus of Electrical Catfishes, with three species from tropical Africa. *M. electricus* from the Nile is about four feet long.

Malaria. [AGUE.]

Malayalim, one of the cultivated Dravidian languages [DRAVIDIANS], spoken by over four millions along the southern parts of the Malabar coast, and in general from Mangalore to Cape Comorin. Dr. Caldwell regards it as "a very ancient dialect of Tamil" (*Languages of India*).

Malayo-Polynesian, a term current in popular ethnological writings, although in ethnology it has absolutely no significance. There is no Malayo-Polynesian race, the peoples thus grouped together being quite distinct [MALAYS, POLY-NESIANS]; but in philology the expression has a very definite meaning, comprising nearly all the languages of the Indian and Pacific Oceans, except those of Australia and parts of New Guinea. This great linguistic family thus extends with little interruption more than half round the globe, from Madagascar in the extreme west to Easter Island in the extreme east, and from New Zealand northwards to Hawaii. It also comprises on the Asiatic mainland nearly the whole of the Malay peninsula and parts of Indo-China. Its diffusion over this vast area, and amongst races of diverse origin, such as the yellow Malays, the brown Polynesians, and the black Papuans, is one of the unsolved problems of anthropology, and, for reasons that cannot here be discussed, must be referred back to extremely remote times. Malay proper is usually, but wrongly, taken as the typical member of the group. Malay is in a comparatively degraded state, and far more archaic forms occur both in the extreme west (Malagasy of Madagascar), and in the extreme east (Tahiti), and, as shown by Codrington, even amongst the Melanesians (Papuans) of the Solomons and New Hebrides. All attempts to connect Malayo-Polynesian with the Aryan, the Semitic, and other linguistic families have failed, and it must consequently be regarded as an irreducible stock language. Except in the Philippine Islands (Tagala-Bisayan), where grammatical forms have acquired a considerable development, it is characterised by a general absence of inflections and even of agglutinated elements, a puzzling simplicity of structure, and a

feeble phonetic system, conspicuous especially in the eastern Polynesian branch, which has been described as "a language without a backbone." Combinations of two or more consonants are mostly impossible, and all words and even syllables must end in vowels, as may be seen in such geographical names as Tamatave (Madagascar), Paumotu, Tahiti, etc. (Pacific Ocean).

Malays, a main branch of the Mongolic division of mankind, who form either the substratum or the dominant element everywhere in the Malay peninsula, in most of the Eastern Archipelago, in Madagascar, the Philippine Islands, and Formosa. But in this oceanic domain there has been a great intermingling of peoples for ages, and in the midst of so much ethnical confusion it becomes extremely difficult to determine the salient features of the primitive Malay type. Hence the discrepancies in the descriptions, even of scientific observers, although that given by A. R. Wallace may, on the whole, be accepted as, perhaps, coming nearest to the truth: short stature, brown skin, straight black hair, beardless and smooth-bodied, with broad face, flat eyebrows, small nose; reserved but courteous, and of cold, undemonstrative temperament, except when roused to uncontrollable fury under some sudden religious or jealous impulse, when the outburst takes the well-known form of "running amuck." The true Malays are found concentrated chiefly in the Malay Peninsula, in central and south Sumatra, Java, Bali, Lombok, the Borneo coastlands, Tidor, Ternate, and the Banda Islands. They are excellent agriculturists, but most inclined to seafaring as traders, and (till recently) corsairs. Some branches, especially in Java and Sumatra, arrived at a considerable degree of culture at an early period under Hindu influences, and the Bali and Lombok islanders are still Hindus in religion; but all the rest of the civilised Malays have been Mohammedans since the close of the 15th century, except those of the Philippine archipelago, most of whom are Roman Catholics. But the uncivilised groups, chiefly found in the interior of Formosa, the Malay peninsula, North Sumatra, Borneo, Celebes, Halmahera, and some of the smaller Sunda Islands, are still pagans often at a very low stage of culture, head-hunters, cannibals, savages in the strict sense of the word. Many of these peoples, however, although usually spoken of as Malays, are not Malays but Indonesians, rather of Caucasian than of Mongolic type, and have little in common with the true Malays except their common Malayo-Polynesian language. [INDONESIANS.] The Malay branch of this stock language is extremely simple and harmonious, and has obtained currency as a sort of *lingua franca* throughout the whole of Malaysia. It has long been cultivated and is written in the Arabic character, which is little suited for the purpose; but the literature, though copious, lacks originality, having been developed mainly under Hindu and Mohammedan influences. There is, however, a good deal of national poetry, as well as folk-lore, legends, and romances, which have at least a decided local colouring. (A. R. Wallace, *The Malay Archipelago*, 1860; Rosenberg,

The Folk-lore of the Malays, in *Journal of the Straits Branch of the Royal Asiatic Society*, 1881; Logan's writings; A. H. Keane, *The Malay Race*, in *Encyclopædia Britannica*, xv.)

Malcolm, SIR JOHN, K.C.B. (1767–1833), soldier, statesman, and historian, was born in Dumfriesshire, and entered as a cadet in the Madras army at the age of 16. In 1799 he was present at the siege of Seringapatam, and in 1800 went as ambassador to Persia. The next year he was private secretary to Lord Wellesley, and in 1803 governor of the Mysore Residency. In 1807 and 1810 he again went on missions to Persia, and in 1812 he came to England and was knighted. Then he took part against Holkar and the Pindaris as brigadier-general, and returned to England in 1822. From 1827–30 he was governor of Bombay, and in 1831 he returned to England and entered Parliament. His works are *Sketches in Persia* (1827), *History of Persia*, *Memoirs of Central India*, *Political History of India*, and *a Life of Clive*.

Malcolm, SIR PULTENEY, naval officer, was born in 1768. He took part in Nelson's pursuit of the French to the West Indies, the battle of St. Domingo, and the action in the Basque Roads, and after promotion in 1813 to flag-rank, participated in the attack on New Orleans, and commanded the forces co-operating with Wellington in 1815. He died an admiral and G.C.B. in 1838.

Malcolm Canmore (*circa* 1030–93), King of Scotland. When his father Duncan was killed by Macbeth in 1040, Malcolm took refuge with his uncle Siward of Northumbria. In 1057 he became king, and, having in 1069 married the sister of Edgar Atheling, he threw in his lot against the Normans. He was eventually ensnared at Alnwick, and there lost his life.

Maldivé Isles, a chain of coral islands and clumps, S.W. of Ceylon, most singularly arranged, and consisting of several hundred islands in 17 groups, of which not 200 are inhabited. The chain has a length of 540 miles—as far as from the Orkneys to Dover—and a breadth of about 40 miles. The people are Mohammedans, but resemble the Cinghalese in language, etc. They are under the protection of England, and their head chief resides on the island of Male. Coir, copra, cowries, coconut, tortoiseshell, and dried bonito are the chief productions and articles of export.

Malebranche, NICOLAS (1638–1715), philosopher, was born at Paris, where his father was secretary to Louis XIII. He was of feeble constitution, and was educated at home. He then studied at the Sorbonne, and in 1660 entered the Congregation of the Oratory. At first he hardly knew his own bent, but a study of Descartes made him adopt the principles of that philosopher, some difficulties in which led him to the doctrine that the perception of a material world or action on it by man is only possible through union with the Deity. These views he expounded in his *Traité de l'Homme* (1664) and *Recherche de la Vérité* (1674) and many other works. He also studied mathematics and physics, becoming honorary member of

the Academy of Sciences in 1699. A collection from his writings was published in two volumes in 1846.

Maleic Acid, an organic acid of composition $C_4O_4H_4$, which crystallises in large prisms, soluble in cold water. It melts at about $130^{\circ}C$., and distils at about 160° , undergoing partial decomposition and forming an anhydride. [FUMARIC ACID.]

Malers, a numerous low-caste people of Behar, north-east India, chiefly in the upland Rajmahal valleys, west of the Sontals. Till the middle of the present century they enjoyed complete political independence, but since then their chiefs have become pensioners of the British authorities, to whom they are responsible for the maintenance of order. The Malers, who number about half a million, resemble the Gonds in type and dress, and, like them, speak a Dravidian dialect.

Malesherbes, CHRÉTIEN GUILLAUME DE (1721–94), minister of Louis XVI., and counsel for his defence. He was born of a legal family, and in his official capacity at Court had the control of the press, a position which enabled him to advance the cause of the *Encyclopédie*. As minister of the King's Palace in 1775 he did much to abolish *lettres de cachet*. After a time spent in country retirement he was recalled to Court in 1787, soon afterwards again to retire, first to the country, then to Switzerland. He came over, however, to defend the king before the Convention, and was soon after arrested in his country retirement, and guillotined with most of his family.

Malherbe, FRANÇOIS DE (1555–1628), poet, critic, and translator, was born at Caen, and educated at Paris, Heidelberg, and Basel. He became secretary to Henri d'Angoulême in Provence, where he wrote some poor verses. After Henri's death he remained for a time in Provence and Normandy, but a poem sent to Marie de Medici called attention to him. He came to Court, and was presented to Henri IV., and an inheritance from his father enabled him to stay at Paris, where he exercised some influence upon the literature of his time.

Malibran, MARIA FELICITA (1808–36), a celebrated operatic singer, was born at Paris, being the daughter of the Spanish singer Garcia. She made her *début* in London in 1825, and met with a great European success. An attempt, however, to establish opera in New York failed, and she there married a merchant named Malibran, who soon after became bankrupt. She then returned to the stage, and sang in France, England, Germany, and Italy.

Malic Acid is an organic dibasic acid, possessing the composition represented by the formula $C_4H_6O_5$. It occurs in many unripe fruits and plants, notably in grapes, pears, apples (hence name—Lat. *malum* = "apple"), gooseberries, etc., and plentifully in the berries of the mountain ash. From these latter it may be conveniently obtained by pressing and boiling the concentrated juice with milk of lime, and then treating the obtained calcium malate with sulphuric acid. It forms

soluble crystals, which, if heated, lose water, and pass into the two isomeric acids *fumaric* and *maleic* (q.v.). It exists in 3 isomeric varieties, which only differ in their action on polarised light. The ordinary acid obtained as above is laevorotatory. [POLARISATION.] Its reactions show that it is closely related to succinic acid, and that its constitution is represented by $\text{CO}_2\text{H}\cdot\text{CH}_2\cdot\text{CHOH}\cdot\text{CO}_2\text{H}$.

Malicolo, the natives of Urumbao Island, in the New Hebrides, who are typical Melanesians, below the average height, with broad flat nose, black, crisp, and almost woolly hair, and blackish brown complexion, but remarkable especially for their extreme dolichocephaly.

Malignant Pustule. [ANTHRAX.]

Malines (MECHLIN), on the navigable Dyle, a decayed city of Belgium, 14 miles S.E. of Antwerp. It has fine buildings and squares and broad grass-grown streets. The large church of St. Rumbold has a *Crucifixion* by Vandyk, and in the churches of Our Lady and St. John are works by Rubens. The 15th-century town-hall, the cloth hall (now a guard-room), and the Archbishop's palace are buildings of note, and there is a monument of Margaret of Austria. The Archbishop of Malines is Primate of Belgium, and the town has some convents. The lace trade, for which the town used to be famous, has now almost passed away from it, and of the few industries the chief are the manufacture of linen, woollens, beer, and needles. Malines is a railway junction.

Malingering, a term applied to "shamming" or feigning disease.

Malleability is the property possessed by many metals of being flattened out or extended, either under the hammer or between rollers. Gold-leaf furnishes a beautiful example of this, gold being by far the most malleable metal known, and capable of being reduced to films less than $\frac{1}{250000}$ of an inch thick. Silver and copper can be beaten into leaves of great tenuity; tin and platinum can be rolled into foil. The other malleable metals are iron, palladium, lead, nickel, cadmium, sodium, potassium, and solid mercury.

Malleable Iron. [IRON.]

Mallet, SIR LOUIS (1823-90), was for many years connected with the Board of Trade. In 1860 he became acquainted with Cobden, with whom he drew up the tariff in connection with the Commercial Treaty with France. He was knighted in 1868, and from 1874-83, after having served on the Indian Council, he was Permanent Under-Secretary of State for India.

Mallet, PAUL HENRI (1730-1807), antiquary, was born at Geneva, and in 1752 was professor of belles lettres at Copenhagen. In 1755 he published an *Introduction to the History of Denmark*, and in 1756 a second part on the mythology and poetry of the Celts and ancient Scandinavians. This was translated into English under the title of *Northern Antiquities* by Bishop Percy, in 1770. Mallet then

became tutor to the Prince of Denmark, and in 1760 professor of history at Geneva.

Mallophaga, a group of Rhynchota (q.v.), including the Bird-lice. They are all of them parasitic on birds; they live either by sucking the blood or eating the young feathers of the host. Some species, however, occur also on the mammals, in which case they live on the young hairs. The Mallophaga are sometimes included with the true Lice (q.v.), as the order Anoplura.

Mallow, the popular name of the genus *Malva*, which gives its name to the dicotyledonous order Malvaceæ, and of some allied plants such as the marsh-mallow, *Althæa officinalis*. *Malva* comprises about 16 species of herbaceous plants, natives of the northern hemisphere, three of which are British. The leaves are palmately-veined; the flowers, white or pink: there is an involucre of three small bracts below each flower: the five persistent sepals are valvate and united; the five petals, convolute and slightly united; the five stamens, at a very early stage copiously branched and united in a tube (monadelphous), the filaments bearing kidney-shaped one-chambered anthers, which split transversely; and the numerous one-seeded carpels are united in a ring, known to country children as "cheeses," round a short carpophore. The pinkish-purple petals of the common mallow (*M. sylvestris*), known in France as *mauve*, which are marked with distinct *honey-guides*, or lines to guide insects to the honey, have given its name to the aniline dye, mauve. The root of the marsh-mallow, being, like all the group, rich in mucilage, is used in making *guimaure* cough-lozenges.

Malmesbury, JAMES HARRIS, EARL (1746-1820), diplomatist, was born at Salisbury, and was educated at Winchester, Oxford, and Leyden. In 1768, as secretary to the embassy at Madrid, he did a valuable piece of diplomatic service, and in 1772 he was sent as plenipotentiary to Prussia. In 1776 he was sent to Russia, where he firmly established his reputation as a diplomatist. In 1784 he went to the Hague and was instrumental in bringing about the restoration of the House of Orange. His grandson, himself a statesman and author of *Memoirs of an Ex-Minister*, edited the *Diaries and Letters* and *Lord Malmesbury and his Friends*.

Malmesbury, WILLIAM OF, was an English historian of the 12th century. He was of mixed blood, but his sympathies were Norman. He became a member of the Benedictine Abbey of Malmesbury, and helped Abbot Godefrey make the first library. He became librarian, and precentor, but declined the abbacy. Robert of Gloucester was his friend, and the chronicler was naturally a partisan of Matilda. His chief works are *Gesta Regum Anglorum*, continued in *Historia Norwella* and *Gesta Pontificum Anglorum*. Many of his works are unprinted, and others lost.

Malmö, a sea-port of Sweden, on the E. of the Sound, opposite Copenhagen, from which it is distant 16 miles. The town, which is on a level plain,

was once fortified, and still retains the tower where Bothwell was confined. The central square is ornamented with trees, and contains the town-hall. There is daily steam communication with Copenhagen, and, at intervals, with Stockholm, Gothenberg, Lübeck, etc., and a considerable trade in timber, iron, tar, oilcake, bones, grain, flower, butter, eggs. A railway connects the town with Stockholm. Malmö was of importance during the ascendancy of the Hanseatic League.

Malone, EDMOND (1741-1812), was born at Dublin, and educated at the university there, and was called to the bar. Having inherited a fortune, he gave himself up to literature. In 1778 his publication of a supplement to Steevens' *Shakespeare* led to much controversy. In 1790 he brought out his own edition with essays, and this gave great satisfaction. He was a keen critic, and had a hand in exposing the forgeries of Chatterton and Ireland. In 1797 he edited Sir Joshua Reynolds' works. The posthumous *Variorum Shakspeare* (1821) was compiled from his materials.

Malory, SIR THOMAS, an author of the 15th century, is supposed to have been a priest or a knight, and of Welsh blood. He is well-known as the author or compiler of *Morte d'Arthur*. Caxton speaks of his having taken it out of certain books of French, and reduced it to English. It was finished in 1470.

Malpighi, MARCELLO (1628-74), was born at Bologna, and may be looked on as the founder of microscopic anatomy, much of his discovery being also due to his practice of vivisection. His chief discoveries were in the direction of capillary circulation, the nature of the secreting glands, brain-matter, the development of the egg, and the like, and his name has been given to some of his discoveries. He also wrote an *Anatomy of Plants*.

Malpighian Corpuscles, oval enlargements of the lymphoid tissues surrounding the branches of the splenic artery.

Malta, a British possession in the Mediterranean (anciently Melita), 58 miles from Sicily and about 180 from the African coast, and having an area of $91\frac{1}{2}$ square miles, and a population, inclusive of some 8,000 British troops, of about 174,000 souls. Agriculture and maritime trade are the chief sources of employment and wealth. Valetta, the present capital of Malta, possesses one of the best harbours in the world, and, besides being an important naval station, is a commercial port of call. The temperature is in summer semi-tropical, and in winter moderate. The island is full of fine ancient buildings; there is an excellent educational system. The government is carried on by a governor (who is usually a general), an executive council of 10, and a legislative council of 6 official and 14 elected members. In 1890 the revenue was £261,254, and the expenditure £266,900. The islands were anciently occupied in succession by the Phœnicians, Greeks, Carthaginians, Romans, and Byzantine Greeks—or, in other words, by the powers which, for the time being, had command of the Mediterranean. After

a period of subserviency to the Moors, it was taken in 1090 by Count Roger the Norman, of Sicily. In 1530 it was transferred to the Knights of St. John, who used it as a stronghold of Christianity against the Turks, withstood a great siege in 1565, and held it until in 1798 they were driven out by Napoleon. In 1800 it passed, by capitulation, from the control of France to that of England, after the inhabitants had risen on the French; and in 1814 the ownership of the islands was confirmed to Great Britain by the Treaty of Paris. Malta has since been retained on account of its value as a naval headquarters and as a step upon the shortest route between England and India; and, to render it serviceable in both these capacities, it has been very strongly fortified and armed, and thoroughly equipped as a first-class naval arsenal. Valetta itself is protected by an enceinte with numerous bastions, and by forts Saint Elmo, Ricasoli, Tigné, Citta Vittoriosa, Sliema, Kaura, Ghoslien, St. Thomas, Monsciar, and Delamara. For governmental purposes, Malta includes the islands of Gozo and Comino, as well as some other islets. The island of Comino has a battery opposite fort Ghoslien, and the island of Gozo has several works. There are also large docks and pontoons, and naval and military depôts and stores of all kinds.

The inhabitants of Malta are the issue of numerous interminglings—aborigines of unknown stock, Phœnicians, Greeks, Romans—all of whom were strongly Arabised during the occupation of Sicily by the Saracens. The Maltese language, still spoken almost exclusively by the peasantry, contains about 70 per cent. of Arab words, although the structure is rather Italian than Semitic. It is spoken in its greatest purity in Gozo, and is obligatory in all the schools. The people are a fine vigorous race, of medium height, with black hair and eyes, and brown complexion. They are a gay, sociable, frugal, and industrious people, increasing so rapidly that many are compelled yearly to emigrate, chiefly to Algeria, Tunis, Egypt, Sicily, and Italy. Including these emigrants, Maltese is at present spoken by about 250,000 persons as their mother tongue; but it is little cultivated, and even in Malta nearly all the periodicals are Italian.

Maltebrun (MALTHE KONRAD BRUNN), the Danish geographer, was born in Jutland in 1775. He was obliged to leave Copenhagen in 1800 on account of his revolutionary sympathies and lived in Paris the rest of his life. There he supported himself by journalism and teaching, and published his *Précis de la Géographie Unirerselle* (reissued in 1872), his *Annales des Voyages*, and his *Géographie Mathématique, Physique, et Politique*. He died in 1826.

Malthus, THOMAS ROBERT (1766-1834), the onomist, was born near Dorking. At Cambridge he became ninth wrangler and fellow of Jesus. He then took orders, and travelled in France, Switzerland, and the north of Europe. Immediately after leaving Cambridge he had published anonymously (1798) the *Essay on the Principle of Population*,

which in 1803 he acknowledged and extended. From 1805 until his death he was professor of political economy at the East India College at Haileybury. Malthus never approved of so-called Malthusian practices.

Malting, the artificial production of germination in grain; a preparation for brewing.

Maltose is a member of the sugar group of carbon compounds, and possesses the composition represented by $C_{12}H_{22}O_{11} + OH_2$. It is produced by the action of diastase or malt extract upon starch, and is so formed in brewing during the processes of malting. It is also the variety of sugar which results from the action of the saliva and the pancreatic juice upon starchy foods during digestion. It is a white crystalline solid, readily soluble in water. By boiling with dilute acids it becomes converted into dextrose (q.v.), which substance it so closely resembles in its chemical properties that considerable care is required for their discrimination. It ferments under the influence of yeast, yielding the usual products of alcoholic fermentation. [FERMENTATION.]

Malvern, GREAT, a watering-place on the Worcestershire side of the Malvern Hills, is in great repute for the purity of its air and the abundance of its water, which is largely used by invalids at the numerous hydropathic establishments. Malvern College, founded in 1865, has about 600 boys. The highest point on the Malvern Hills, where there are several ancient camps, is the Worcestershire Beacon, 1,395 feet in height. West Malvern is in Herefordshire.

Mamelucos, the name given in Brazil to the offspring of Portuguese fathers and Indian, especially Guarani, mothers. They are generally a finer race not only than the natives but even than the whites, far surpassing them in vigour and enterprise.

Mamelukes, a body of Egyptian cavalry, so called (Arab. *mamlūk* = "purchased slave") because the original members were slaves of various nationalities sold by Jenghiz Khan to the Sultan of Egypt in the 13th century. They soon (about 1250) seized the government, and made one of themselves sultan or Mameluke Bey. Their rule was maintained until 1517, when they were overpowered by the Turkish sultan Selim I., after which they formed part of the Egyptian army until in 1811 Mehemet Ali had most of them massacred, because they were too powerful.

Mammals, the name (from the Latin *mamma* = "the breast") given by Linné to the highest class of vertebrates, from the fact that the females nourish their young with milk secreted by the mammary glands. The class is a very large one, and includes forms differing enormously in point of size. According to Sir William Flower, "the extremes are marked, on the one hand, by the whale known as Sibbald's Rorqual, which attains a length of 80 feet and a weight of nearly as many tons, and, on the other, by the Pigmy Shrew and the Harvest Mouse,

which can climb a stem of wheat." At the head of the class stands Man, and, like Man, very many of the lower forms are terrestrial, as the horse and the cow; others are arboreal as the squirrels and monkeys, or burrowers as the moles and many rodents; a few are aerial, as the bats, while others are aquatic as the whales, seals, and manatees.

There are usually four limbs, though the posterior pair, corresponding to the human legs, are absent in the whales, manatees, and dugongs, or only represented by small vestigial bones. The fore limbs are always present; but may be modified into wings (as in the bats), into spade-like organs (as in the moles), or into paddles in aquatic mammals. The vertebræ are generally prolonged into a caudal portion or tail, which may be prehensile, as in the New World monkeys; a swimming organ, as in the Cetaceans and Sirenians; or it may be used to express emotion as in the dog; or to drive away insects as in the hoofed animals generally.

The skin is generally more or less covered with hair (q.v.), which differs very widely in character, being soft and velvety (as in the mole), bristly in the pig, and spine-like in the hedgehog and porcupine. The Cetaceans are practically hairless, and the want of the usual skin covering is supplied by a thick layer of blubber immediately beneath the skin. In very many forms, especially in those from cold climates, the hairs are of two kinds: one long and stiff, the other short and soft. This is notably the case with the fur-seal; the seal-skin of commerce being the skin of the animal after the long hairs have been removed.

Mammals differ from birds and reptiles in having two condyles instead of one for the articulation of the occipital bone to the vertebral column. The lower jaw or mandible consists of two branches ossified in front as in Man, or united by a ligament. The brain has two hemispheres, united by a commissure, the *corpus callosum*. The heart is four-chambered, the pulmonary and systemic circulations are distinct, the red blood-corpuscles are without a nucleus and, except in the camel family, circular in form. The body cavity is divided into a thoracic and abdominal portion by a muscular partition called the diaphragm or midriff. Respiration is effected by lungs, and the visceral arches of the embryo never carry gills, as do those of fishes and Amphibians. With the exception of Monotremes (q.v.), which are oviparous, the young are brought forth alive. Mammals form three sub-classes:—

I.—Prototheria:

Order 1.—Monotremata. [MONOTREMES.]

II.—Metatheria:

Order 2.—Marsupialia. [MARSUPIALS.]

III.—Eutheria. True, or Placental Mammals, the Monodelphia of De Blainville. There is a single uterine cavity opening into a vaginal passage, always distinct from the rectum. During intra-uterine life the young are organically connected with the parent by means of a placenta (q.v.), through which the blood of the mother passes to nourish and purify that of the fœtus.

- Order 3.—Edentata (sloths, ant-eaters, armadillos, pangolins, and aardvarks).
 „ 4.—Sirenia (manatees and dugongs).
 „ 5.—Cetacea (whales, dolphins, and porpoises).
 „ 6.—Ungulata (hoofed animals).
 „ 7.—Rodentia (rodents).
 „ 8.—Carnivora (cats, dogs, bears, and seals).
 „ 9.—Insectivora (shrews, moles, and their allies).
 „ 10.—Chiroptera (bats).
 „ 11.—Primates (lemurs, apes, and man).

With regard to the origin of the class, opinions are divided as to whether they sprang from a Reptilian or an Amphibian stock. It has been suggested that from the last named source came the earliest mammals, and the extinct Anomodont reptilians in divergent lines. Professor Mivart thinks that the monotremes may have had a Reptilian and the marsupials an Amphibian ancestry.

At the base of the Secondary System the oldest known mammalian remains are found. The chalk of North America has yielded many forms, and in 1891 the first mammalian remains from the European Cretaceous were obtained in the shape of a tooth of *Plagiaulax*, from the Wadhurst Clay near Hastings. All these remains are very small, and belong to the Implacental Mammals (monotremes and marsupials). It is not till Eocene strata that Placental Mammals are certainly met with, and these are of much more generalised type than those living at the present day.

Mammary Gland. [BREAST.]

Mammoth, a name of Russian origin, applied to *Elephas primigenius*, the best known of fossil elephants. It occurs in Pleistocene rocks, and was undoubtedly contemporaneous with man in Europe, as proved by the etched portrait of the animal on a piece of its own tusk found in the cave of La Madelaine in the Dordogne. It had a remarkably wide geographical distribution, being found in Ireland, Scotland, the river-gravels of almost every county of England, Europe as far south as Santander in Spain and as Rome, North America, and especially Siberia. The Liakov and Bear Islands are said to be almost made up of its bones; and in several instances the entire body, with the flesh, the skin, the reddish wool and long hair, and even the eyes, has been found frozen in the soil of the tundras of northern Siberia. The tusks of these fossil elephants were brought regularly to Khiva in the 10th century, and are now taken to China and, *viâ* Archangel, to London. They are sometimes nine or ten feet long and remarkably curved. The grinding teeth consist of from 3 to even 30 narrow plates, and in these and other skeletal characters the mammoth most nearly resembles the Indian elephant; but its wool and hair were obviously adaptations to a glacial or subglacial climate.

Mammoth Cave (1) is in Edmondson county, near the Green River, in the centre of Kentucky. It is 10 miles long, from 40 to 300 feet wide, and its highest shaft, Lucy's Dome, is 300 feet. It is divided into numerous chambers and grottoes, in which are to be found many interesting blind fish and crustaceans. Branches of a subterranean river run through some of these. (2) There is also a large

cavern called by this name, containing a subterranean lake, in California 12 miles from San Andreas.

Man, ISLE OF (Celt. *Man* = "district"), is in the Irish Sea. 27 miles from the nearest points of England and Ireland, but 11 miles nearer Burrow Head, Wigtownshire. It is 31 miles long and 13 broad in the widest part, having a total area of 209 square miles. The Calf of Man, 3 miles to the south-west, is a fertile island 800 acres in extent. In 1266 Magnus, King of Norway, ceded his rights over it to Alexander III. of Scotland, on whose death the inhabitants placed themselves under the protection of Edward I. of England. By him and his successors temporary grants were made to English nobles, who took the title of king, and from 1403 to 1651 the Stanleys, Earls of Derby, ruled it. Owing to the royalism of the Countess it was taken from them by the Parliament, but was restored at the Restoration, and in 1735 passed by descent to the Duke of Athol. Thirty years later the sovereignty of the island was purchased by the British Crown; but it was not until 1829 that, in pursuance of an Imperial Act passed four years before, full rights were obtained over it by further purchase. Man still retains a semi-independence, having its own Governor and Parliament called the Tynwald, the latter consisting of a council of eight and a House of Keys, or Representatives. In 1866 popular election was enacted, and in 1880 household suffrage was established and women were enfranchised. Laws are still promulgated on the Tynwald Hill in Manx as well as English, but the Celtic dialect is now almost obsolete. The bishopric of Sodor and Man, traditionally founded by St. Patrick, consists now of the Isle of Man only. The climate of the island is very pleasant, and much of the scenery picturesque. A range of mountains runs from north-east to south-west, Snaefell (2,024 feet) being the highest point. The herring and cod fisheries are an important industry, and the lead-mines are very rich. Zinc and other minerals are also found, much cattle is pastured and exported, and some corn is grown. The tailless cat of Man still exists, but the Manx puffin is extinct. Man is rich in relics of remote antiquity—the Tynwald Hill in the centre of the island, Castle Rushen, and Peel Castle being the most notable. The chief towns are Douglas, Peel, Ramsey and Castletown, the old capital.

Manasseh (Heb. = "causing to forget"). 1. Elder son of the patriarch Joseph; territory on both sides of the Jordan was awarded his tribe.

2. The 13th king of Judah, succeeded his father Hezekiah when a child in 697. In the course of a long reign he restored the heathen worship and was carried captive to Babylon.

Manatee, any individual of the Sirenian genus *Manatus*, with three species—*M. australis*, from the rivers on the west coast of tropical South America, *M. inunguis*, confined to the Amazon and Orinoco, and *M. senegalensis*, from West Africa. The maximum length may be put at about eight feet, and the colour is bluish-grey above, lighter below. They

frequent estuaries and lagoons, and feed on aquatic vegetation. The manatee differs from the dugong (q.v.) in the incisors, in both sexes, being replaced in the adult by horny pads, and in the greater number of the molars. The tail is rounded, and there are rudimentary nails on the digits. The flesh is eaten, and fat yields a valuable oil, and the skin is made into leather. Specimens have been exhibited at the Brighton Aquarium and the Zoological Gardens, Regent's Park.

Mancha, LA. [CASTILE.]

Manche, LA (Fr. "sleeve"). 1. The French name for the English Channel.

of Manchester by the opening of the Bridgewater Canal in 1761; but the modern epoch in its history dates, of course, from the subsequent introduction of machinery. In the first half of the 19th century the population more than quadrupled itself, and from the "largest village in England" it became the third or fourth town after the lapse of little more than a hundred years. In 1830 the Manchester and Sheffield Railway was opened; in 1832 Manchester became a parliamentary, and in 1838 a municipal borough; and soon after the formation of the bishopric in 1847 it was declared a city. The part which it took in the abolition of the Corn Laws, besides increasing its



THE TOWN-HALL, MANCHESTER.

Valentine & Sons, Dundee, phot.

2. A department in the N.W. of France, having the Channel on every side except the east. It has an area of 2,289 square miles, the large part of which is arable land. There are extensive apple orchards, from the produce of which much cider is made, and valuable granite quarries; and fine breeds of horses, cattle, and sheep are reared. The capital of the department is St. Lô, but Cherbourg is the most important town. Cape La Hague is the north-western point.

Manchester, England, is 31 miles E.N.E. of Liverpool and 187 miles N.W. from London by railway. It stands on the east bank of the river Irwell, being connected with Salford on the other side by numerous bridges. It was an important Roman station known as Mancunium, the Saxon name being Manceastre. The early history of the city is obscure, but it is known to have had some importance as a trading town as early as the 14th century. A fresh impulse was given to the increasing trade

commercial importance, also made it a political centre; while the foundation of Owens College in 1851, the nucleus of the future Victoria University (q.v.), rendered it the educational headquarters of northern England. By the Reform Bill of 1867 Manchester gained two additional members; by that of 1885 the area of the political borough was increased, and it was divided into six single-member constituencies, Salford having also three of its own. Besides the tramways, the supply of water and gas is absolutely in the hands of the Corporation; and the town-hall, designed by Waterhouse and finished in 1883, is the finest municipal building in the world. Manchester and Salford with their environs draw their water supply partly from Blackstone Edge, and partly from Thirlmere Lake, in Cumberland. The chief buildings are the cathedral or "Old Church," which dates from 1422 and is celebrated for the beauty of its choir; the Roman Catholic cathedral of St. John's; the Royal Exchange, finished in 1874, having the largest exchange-room

in Europe; the Assize Courts, designed by Waterhouse and finished in 1864; and the Free Trade Hall. There is a large and important technical school, and the Technical Instruction Act has been adopted. Manchester grammar school was founded in 1515, and is now rich in endowments, while the Hulme foundation also provides higher education. Besides the great cotton industry, woollen and silk fabrics are largely manufactured, and the making of machinery and chemicals employs thousands of people. The factories are almost all in the environs, the main part of the city being occupied by warehouses and offices. Manchester is, of course, a most important railway centre. The construction of the Ship Canal in 1887-91, connecting it with the sea, put the finishing touch to its immense commercial advantages.

Manchester, a rising city in New Hampshire, United States, situated on the west bank of the Merrimac river, 16 miles below Concord, was settled in 1722, and assumed its present name in 1810. It has been the seat of a Roman Catholic bishop since 1846. It has important cotton and woollen manufactures, and machines of all kinds are also made. Water-power for the mills is obtained from the Amoskeag Falls through canals.

Manchester, EDWARD MONTAGU, second EARL OF (1602-71), is remembered in history as the Lord Kimbolton who was charged with treason in January, 1642, in company with the Five Members of the House of Commons. During the Civil War he commanded the Parliamentary armies first in the eastern counties, and afterwards at Marston Moor and the second battle of Newbury; but he was not energetic enough to suit Cromwell, and was deprived of his command by the Self-denying Ordinance. He afterwards opposed the trial of Charles I., and was made Lord Chamberlain for his services in connection with the Restoration and as a leading Presbyterian. His grandson was made a Duke in 1719 for his steadfast Whiggism.

Manchu, a main branch of the Tungus division of the Mongolo-Tatar race, whose proper name is *Niuchi*; the term *Manchu* was till the 17th century restricted to a single tribe in the White Mountains, but was extended to the whole of the region north of China, now known as Manchuria, after its reduction by Taitsu, founder of the present Manchu dynasty in China (1643-44). But since the conquest the great bulk of the inhabitants of Manchuria have become Chinese, and of the primitive Manchu stock probably not more than half a million survive anywhere. The Abbé Huc went so far as to say that "at present the Manchu nationality is annihilated; one may search in vain in Manchuria for a single town or village which is not exclusively Chinese. All local colouring has been completely effaced, and, with the exception of a few nomad groups, nobody any longer speaks Manchu." In the primary schools Chinese alone is taught, and the national language would have already disappeared but for the fact that it is specially studied in China itself in consequence of

the Manchu origin of the reigning family. It has thus become one of the classical languages, which competitors for the higher Government offices are obliged to learn, and which is indispensable to all students of recent Chinese history. Manchu is a Tungus dialect noted for the regularity of its grammatical structure, and, like Mongolian, written in vertical columns from left to right in a peculiar script based on the Syriac, which was introduced into Mongolia in the 13th century. Apart from the arrogant mandarins of Manchu stock, the race itself is distinguished by its courtesy and friendliness towards strangers. As amongst the Koreans, there appears to be a strain of Caucasian blood, shown by the frequent occurrence of grey or blue eyes, brown hair, and florid complexion.

Manchuria, the country of the Manchus, is that part of the Chinese Empire which lies between Mongolia and Corea, having the river Amur as its northern boundary. The total area is nearly 400,000 square miles, and it is divided into the provinces of Tsitsihar or Helung-tsian (the northern portion), Kirin or Central Manchuria, and Leaou-tung or Moukden, the southern division. The last, however, appears on some maps to be divided, part only being assigned to Manchuria. With the exception of the district between Moukden and the Gulf of Leaou-tung, Manchuria is very mountainous. The chief ranges are the Shan-a-lin or "Long White Mountains," which extend from the Amur to the Gulf of Leaou-tung, and the Chingan Mountains in the north. They are interspersed with fertile valleys, and the scenery here is very beautiful. The three chief rivers are the Sungari, which rises in the Shan-a-lin, and, after joining the Nonni, flows in a north-westerly direction till it reaches the Amur; the Hurka, which joins the Sungari at San-tsing; and the Usuri, still farther towards the east. The Sungari is navigable as far as Kirin, but the Hurka is impeded by torrents. All the Manchurian rivers abound in salmon and other fish. In 1888 the floods did immense damage. The chief productions of the soil are millet, poppies, maize, beans, and rice; and large pine-woods clothe the hills. The not inconsiderable mineral resources of the country have not yet been taken advantage of to any large extent, though the gold-mines have begun to be worked. The chief exports are beans, silk, and fur; and the making of opium and furniture, with distilling and tanning, are the principal industries. The Manchurians long maintained a struggle with the Chinese, but in 1644 the grandson of their great chief, Narhac-chu, ascended the throne of China and founded the Chin dynasty. Most of the inhabitants of Manchuria are now Chinese. The chief towns are Moukden (or Shing-yang), Kirin, Tsitsihar, and Niu-chwang or Ying-tzu, the chief port. [CHINA.]

Mandæans, NASOREANS, or SABIANS, a small religious sect dating from the early centuries of Christianity, which professes a kind of Gnosticism mingled with Judaistic and Zoroastrian elements. Some of them still survive at Sug esh-Shia, about Basra, at the head of the Persian Gulf.

Mandaic, a corrupt Syriac dialect in which are written the Genzâ (Codex Nasaræus) and other writings of the Nazarenes or Mandæans (q.v.). The word *Manda* is referred to root *yada*, "to know," by Dr. A. J. Brandt, who gives the best account of these people in *Mändaische Religion*, etc. (Leipzig, 1889).

Mandalay, the chief town of Upper Burma, is situated a little to the east of the Irawady, near Amarapura, the old capital, and some 30 miles north of Ava. From 1860 to 1886 it was the capital of Burma, but by the treaty of the latter year it fell into the hands of the English, by whom it had been captured in 1885. The chief object of interest in the place is the Aracan Pagoda, containing a brass image of the Buddha 12 feet in height. Silk-weaving, carving, and gold- and silver-working are the chief industries. The year of the British occupation was marked by a great fire and disastrous floods. [BURMA.]

Mandamus ("we command"), a high prerogative writ issued in the Queen's name from the High Court of Justice. It is in the nature of a command, and may be addressed to any person, corporation, or inferior Court of Judicature within the kingdom, requiring them to do something therein specified which appertains to their office, and which the court holds to be consonant to right and justice. It is used mainly for public purposes and to enforce performance of public rights or duties. It, however, is also sometimes used to enforce private rights when they are withheld by public officers.

Mandans, North American aborigines, a distinct branch of the Dakotan family, who formerly lived in well-constructed huts in the Missouri valley round about Fort Berthold, whence they ranged northwards to Canada. *Mandan* appears to be a corrupt form of the Dakotan *Matani* or *Mawatani*, their own original name being *Numakaki*, "Men." They were allies of the neighbouring Arikarees and Paunches (Gros-Ventres), and noted especially for the frightful ordeals (described by Catlin) which the young men had to undergo during the ceremonies of initiation into the rank of hunters and warriors. The Mandans are now (1893) reduced to 250, all grouped with the Hidatsas in Fort Berthold Reservation, North Dakota. (Catlin, Matthews, Powell.)

Mandara, MANDALA, a Negro people of East Sudan, conterminous on the north with the Shirs of the Bahr-el-Arab; appear to have come originally from Baghirmi, whence they migrated to escape from the slave-hunters from Lake Chad. At present nearly all are Mohammedans, and at the beginning of the late Mahdist revolt they took part with the Baggara Arabs and with the Nuers in their attacks on the Egyptian stations of the Equatorial Province.

Mandeville, BERNARD DE (1670-1733), a satirical writer, was the son of a Rotterdam physician. He took his own degree in medicine at Leyden in 1691, but soon afterwards came to London, where he practised as a physician for many years. In 1705 he published a sixpenny pamphlet

under the title of *The Grumbling Hire; or, Knaves turned Honest*, which ridiculed the charges of political corruption then rife. In 1714 this was bound up with *An Inquiry into the Origin of Moral Virtue* and *Remarks* on the former work; and these, together with an *Essay on Charity Schools* (in which philanthropy was lightly treated) and *A Search into the Origin of Society*, were brought out together in 1723 under the title of *The Fable of the Bees*. The leading idea of the whole is that "private vices are public benefits."

Mandeville, JEHAN DE, popularly called SIR JOHN MANDEVILLE, the name by which the compiler of a book of travels called himself. The book itself was in all probability originally in French, though there are early Latin editions. The first MS. must have appeared between 1357 and 1372. The first English version was made early in the 15th century and was printed by Wynkyn de Worde in 1499, the French text having appeared in type in 1480. The compiler, who may have been a physician named Jehan de Bourgoigne, not only draws largely upon his imagination, but borrows the bulk of his matter from other works such as those of Friar Odoric (1330) and John of Plano Carpini, a Franciscan monk.

Mandingans, the dominant people of west Sudan, whose innumerable branches and tribal groups occupy the greater part of the region between the Joliba (Upper Niger) and the Atlantic coast; many also have long been settled amongst the Tuaregs (Berbers) of south-west Sahara beyond the Senegal river. Some are pure negroes, and still pagans in a low state of culture; but the great majority are Negroid (half-caste Negroes and Berbers), who at an early date embraced Islam, founded powerful Mohammedan empires, such as Mali (or Melle) and Guiné in west Sudan, besides the more recent states of Moasina, Bambara, Kong, and others in the middle Niger basin and about the head-waters of the Volta and other streams flowing to the Gulf of Guinea. All these may be regarded as semi-civilised, having developed a certain degree of culture under Moslem influences, although none have adopted either Arabic or Berber languages, but still everywhere speak more or less divergent forms of the original Mande Negro tongue. The term *Manding* (properly *Manding'ke*, i.e. "People of Manding") has reference to the district of that name on the Upper Niger, which is claimed to be the cradle of the race. The capital of this district was Mali, which gave its name to the vast empire of Mali overthrown about 1500 by the Sonrhay Sultan, Omar Askia; but the name still survives in the national traditions, and from it the Upper Niger group call themselves *Mali'nké*, i.e. "People of Mali," in contradistinction to the *Soninké* of the Senegal basin, the *Jalonké* of Futa-Jallon and the Bamana of Bambara, these being the other more important historical Mandingan nations.

Mandoline, a musical instrument of the lute class, with six metallic strings (single or double) stretched on a stout, almond-shaped body, and

with many frets on the neck. It is played with a plectrum, and has generally a compass of about three octaves upwards from G below middle C. It has a pleasant tinkling *timbre*.

Mandrake (*Mandragora officinarum*), a handsome but poisonous plant belonging to the Solanaceæ and nearly related to the deadly nightshade. It is a native of the Mediterranean region, and has ovate radical leaves, bluish-purple bell-shaped flowers, one on a stalk, and a fleshy, orange, berry-like fruit. It is truly emetic, purgative, and narcotic, and was anciently used as an anæsthetic, as is alluded to in Shakespeare. From still earlier times the fancied resemblance of the fleshy and often forked root to the human body gave rise, under the doctrine of signatures (q.v.), to a mass of superstition. It was a potent love-philtre and of service in pregnancy, the *dudaim* of Genesis (chapter xxx.) being undoubtedly this plant. It was potent in all kinds of witchcraft, curing demoniacs, according to Josephus, and even among the Germans being credited with prophetic powers, so that, as might be supposed, the mere possession of the root was lucky. When pulled up, however, it shrieked, and the hearer was liable to madness and the gatherer to death, so that a dog was tied to the plant and the ears were stopped. At the present day the roots of the white bryony (*Bryonia dioica*) are sold by quacks as mandrakes.

Mandrill (*Cynocephalus maimon*), a large baboon from tropical West Africa, partially insectivorous in diet. The general hue is olive-grey, but the face is striped with blue and scarlet, and the seat-pads are blood-red.

Manes Worship, a particular form of ancestor worship (q.v.) practised in ancient Rome. [LARES.]

Manfred, a natural son of the Emperor Frederick II. and Bianca Lanzia, was born about 1231. He was created Prince of Tarentum by his father, and at his death Regent of the two Sicilies during the absence of his half-brother, the Emperor Conrad IV. He defended Sicily and Apulia against Pope Innocent IV., and in 1258, when Conradin, son and successor of Conrad IV., was supposed to have died, was proclaimed king. Even when assured of the death of his nephew, he refused to surrender his power, though protesting he would do so on his death; and he was excommunicated by Pope Alexander in 1259. Manfred defeated the troops of the Holy See at Monte Aperto, but was again excommunicated in 1261. Two years later his crown was offered by Urban IV. to Charles of Anjou, and a "crusade" was proclaimed, the result of which was the defeat and death of Manfred at Benevento in 1266.

Mangalore, a seaport on the Malabar coast of Hindostan about 100 miles north of Calicut. It is the administrative headquarters of the South Kanara district, and has a large export trade, chiefly in coffee. It was the headquarters of Hyder Ali's navy, and was afterwards taken by Tippoo

Sultan, but was retaken by the British in 1799. Mangalore is the seat of a Roman Catholic bishop, and also of the Basel Lutheran mission.

Mangals, a branch of the Afghans, upper Kuram Valley and Zurmat district; six main divisions: Miral, Khajari, Zab, Margae, Kamal, Lajhwar; claim to be of Mongol descent, but now speak Afghan exclusively, and are all Sunnite Mohammedans.

Manganates. [MANGANIC ACID.]

Manganese is a metallic element which occurs naturally only in the combined state. The chief of the manganese minerals are the oxides, *e.g.*, *Pyrolusite* or *black oxide*, MnO_2 ; *braunite*, Mn_2O_3 ; *hausmannite*, or *red oxide*, Mn_3O_4 ; the carbonate, *white manganese*, $MnCO_3$; while it also occurs in certain iron ores, and in small quantities in many siliceous minerals. Pyrolusite, the black oxide of manganese, was known in early times, and used in glass-making. It was, however, supposed to be a compound of iron, and was much confounded with magnetic iron ore. The distinctive character of the manganese compound was shown at the close of the last century, and the metal itself obtained. It may be prepared by strongly heating an intimate mixture of the oxide with charcoal. It is then formed as a reddish white metal, brittle, and hard enough to scratch glass. It has a specific gravity of 8. and atomic weight 54.8. It decomposes water with evolution of hydrogen and hence oxidises rapidly in air and should be kept under naphtha or in sealed tubes. It forms a number of oxides and two definite series of salts, the *manganous* salts corresponding with the oxide MnO , and *manganic* salts corresponding to the oxide Mn_2O_3 , while some salts derived from the dioxide MnO_2 are also known. The higher oxides possess acid, forming properties, and give rise to two acids, *manganic acid* (q.v.) and *permanganic acid*. It is usually estimated quantitatively as the carbonate or red oxide Mn_3O_4 . The pure metal finds no application for industrial purposes, but its oxides are employed in glass-making and the manufacture of chlorine. Alloys with iron, *spiegeleisen* and *ferromanganese*, are also largely used for the production of steel, as the presence of small quantities of manganese in the iron improves the quality of the steel obtained and greatly increases its tenacity.

Manganic Acid. When manganese compounds are fused with nitre a green mass results which dissolves in water, yielding a solution which passes through a variety of colours from green to red. It appears to contain an acid, *manganic acid*, H_2MnO_4 , which is very unstable and rapidly decomposes. Many of the salts, termed *manganates*, are known. The potassium and sodium salts form green crystals isomorphous with those of the corresponding sulphates, and barium manganate exists as an emerald green crystalline powder employed to a small extent as a pigment.

Manganite, the hydrous sesquioxide of manganese ($Mn_2O_3 + H_2O$), an ore of manganese and a source of oxygen, though, owing to its

smaller percentage (27·5) of oxygen, of less value in the latter application than pyrolusite (q.v.). It occurs in sub-metallic, iron-black crystals, which are rhombic prisms, and has a hardness of 4 and specific gravity of about 4·3. It is found at various places in Cornwall, the Mendip Hills and elsewhere.

Manganja (MAGANJA), a large Bantu nation, whose territory lies mainly between the Zambesi and the Shiré emissary of Lake Nyassa. When first visited by Livingstone they formed numerous petty states, whose chiefs recognised a paramount lord, Rondo or Rundo, to whom they paid a small yearly tribute, and who also claimed one of the tusks of all elephants killed in their territory. But since the arrival of the Makololos these relations have been altered, and at present the Manganjas acknowledge the British authorities in Nyassaland. [MAKOLOLO.] The Manganjas are an industrious people, good agriculturists, cotton-weavers, and workers in iron. Many attend the Scotch mission stations in the Shiré district, and their Bantu language (Chi-Nganja) has been reduced to written form by the missionaries.

Mange, a disease affecting the skin of dogs and other animals, due to a parasite resembling the itch mite which attacks the human subject. [ITCH.] Treatment consists in the enforcement of cleanliness of the skin, and in the use of ointments, such as sulphur ointment, with a view to destroying the parasite.

Mango (*Mangifera indica*), a small tree belonging to the terebinth family, indigenous to tropical Asia, but now cultivated throughout the tropics. It has scattered entire leaves and panicles of small pink or yellow flowers. Though its glossy leaves make it valuable for shade, it is chiefly valued for its drupaceous fruit, which varies considerably in size and flavour, though it seems always to have a slight flavour of turpentine. In an unripe state it is used in pickles; but in India is largely eaten when ripe as a dessert fruit. Containing gallic acid, it will stain a steel knife blue. The seeds, bark and resin have some medicinal value, apparently as astringents, and the wood, though soft, is used as timber.

Mangold-wurzel, a variety of beet (q.v.), *Beta vulgaris macrorrhiza*, largely grown as food for cattle, being almost as nutritious as swedes (q.v.), and not, like them, liable to the attacks of the turnip beetle. It flourishes on the light soils of our southern counties, where it is too hot and dry for the turnip.

Mangoni (ANGONI), a widespread Bantu people, who occupy the whole of the plateau stretching west from Lake Nyassa. They came originally as conquerors from Zululand, and still speak Zulu mixed with many terms borrowed from the languages of the tribes reduced by them. Before the establishment of an orderly government by the British Chartered Company the Mangoni frequently raided the shores of the lake, and even extended their excursions into the Shiré basin, plundering

and murdering the Manganja and carrying the women and children into captivity. (James Stewart, *Lake Nyassa, Proceedings of the Royal Geographical Society*, 1882.)

Mangosteen (*Garcinia Mangostana*), a small tree belonging to the gamboge tribe, native to the Moluccas, but now cultivated elsewhere. It has large, glossy, leathery, entire leaves. The fruit, esteemed as one of the most delicious in the world, resembles a small orange, but is reddish-brown, becoming chestnut. Its thick rind yields an astringent juice containing gamboge (q.v.), and its pulp is snow-white with a flavour compared to a combination of peach and pine-apple. It is quite wholesome, and is recommended in cases of fever.

Mangrove, the name of a group of trees mostly belonging to a small dicotyledonous order, the Rhizophoraceæ, but applied also to the white mangroves (*Avicennia*), which belong to the ver-



MANGROVE.

bena family. Mangroves grow on estuaries, salt marshes, and muddy shores along the coasts of both hemispheres within the tropics, flourishing in salt water, sending down numerous adventitious rootlets from their branches to the mud, and even tap-roots, from the seeds in the fruit still on the trees. Some have hard durable wood, and the bark is used in tanning. The common mangrove is *Rhizophora Mangle*.

Manguianes, a people of the Philippine archipelago, dominant in the interior of the large island of Mindoro, where they continue to defy the Spanish authorities. Some, however, have entered into friendly relations with the neighbouring Christian communities, while the great bulk are either nominal Mohammedans or pagans. These are the people of whom Careri related, on the report of the Jesuits, that they were furnished with tails four or five inches long. They appear to be of Malay stock crossed with Negrito blood.

Mania. [INSANITY.]

Manichæans, MANICHEANS, MANICHEES, heretics who in the 3rd century followed an Oriental mystic, Mani or Manichæus. Their tenets were a strange mixture of Christianity with Gnosticism, Buddhism, Zoroastrianism, and other systems. They worshipped the principle of darkness and evil

as well as that of light and goodness. They were ascetics, but are charged with gross immorality. The sect did not die out until the 7th century, and much of its doctrine survived in the sects of the Paulicians, Albigenses, etc., grouped as New Manichæans.

Manila, or MANILLA, the capital of the Philippine Islands, stands at the back of a bay in the south-west of the island of Luzon. The river Pasig divides it in two parts, the southern consisting of the old town, founded by Legaspi in 1571, whilst on the northern bank is the trading and fashionable part of the city. The cathedral and archbishop's palace, as well as the university, observatory, and arsenal, are in the Plaza de Manila, or old city. The harbour is unsafe during the monsoons, and large vessels have to shelter in the naval port of Cavité. The climate generally is very hot, but not unhealthy, and, besides the monsoons, there are not unfrequently terrible earthquakes and hurricanes. For this reason the houses are generally built of wood. No glass is used, and the streets are lighted by kerosene oil lamps. The greater part of the population consists of the native Tagals; but, besides the Spaniards, there are many Chinese and Europeans. The trade, which is largely in British hands, has rapidly increased since the expiration of the privileges of the Royal Philippine Company in 1834. Manila hemp, sugar, coffee, and cigars are the chief exports, women being chiefly employed in making the last-named. Railways have only been opened in Luzon during recent years.

Manila Hemp, the fibre obtained from the sheathing leaf-stalks of *Musa textilis*, a plant belonging to the same monocotyledonous genus as the banana and plantain, native to the Philippine Islands. It is almost exclusively cultivated in its native country, where the finer fibre is used in a raw state for shawls, etc. It is exported in increasing quantity from Manila and Cebu to England, the United States, and Australia, being the most valuable of cordage fibres and valuable also for paper-making. It is adulterated with New Zealand flax and with hemp.

Manin, DANIELE (1804-57), a Venetian patriot of Jewish descent, was born at Venice, where, after studying at Padua, he pursued his father's profession, that of an advocate. Many years before 1848 he became the chief leader of the anti-Austrian party, and on January 18 of that year was arrested and imprisoned. On the news of the revolutions in Paris and Tuscany he was released by the people, and on March 22 was appointed President of the republic. A year later, when Charles Albert was defeated, Manin was given unlimited powers in order to resist the Austrians; but on August 24 Venice was compelled to capitulate, and he was obliged to leave it for Paris, where for the rest of his life he taught Italian. In 1868 his remains were removed to Venice, where a statue was erected to him in 1875.

Manipur, or MUNIPUR, the name of a small state in the north-east of India, lying between

Assam and Upper Burma. The greater part of the population is concentrated in the Kuboo Valley. The country is ruled by a rajah, but a British agent resides at his capital, Manipur, or Imphail. On March 24, 1891, Mr. Quinton, the Chief Commissioner of Assam, Mr. Grimwood, the Resident at Manipur, and other British officers and civilians were treacherously assassinated by Tekenradgit Singh, whom they were about to depose. He was afterwards tried and executed, and a tribute was imposed upon the state.

Manipuri, a large semi-civilised nation on the north-west frontier of Upper Burma, who form the bulk of the population in the state of Manipur, and also the districts of Kachar and Sylhet farther north; have long been Hinduised in religion; but, although claiming Aryan descent, they appear to be a branch of the Kuki race, probably sprung from the old Kumal, Luang, Moirang, and Maithai tribes, who within comparatively recent times still inhabited the Manipur valley. They speak a language of Tibetan stock, which is cultivated and written with a peculiar alphabet based on the Devanagari.

Manitoba, a province of the Dominion of Canada, situated between Ontario, Saskatchewan, and Assiniboia, having the district of Keewatin as its eastern and the United States as its southern boundary. In area it is little smaller than the United Kingdom. The germ of the present colony was the Red River Settlement formed by Lord Selkirk in 1812. In 1868 the governmental rights of the Hudson's Bay Company were purchased, and two years later Manitoba was constituted into a province of Canada. In the same year Riel's rebellion was put down, and since that time the relations with the Federal Government have been comparatively smooth. The province is under a Lieutenant-Governor, with an Executive Council of five and a single elective Assembly of 40 members. It is represented in the Dominion Senate by three, and in the House of Commons by five members. The winter in Manitoba is very severe, but the atmosphere is dry. The soil is very fertile, and the wheat grown on it is considered the finest in the western hemisphere. Dairy- and cattle-farming are also carried on with success; root crops are very prolific, and manufactures are growing. Some coal is found in the south, and the smaller fruits are indigenous. In the three great lakes, Winnipeg, Winnipegosis, and Manitoba, as well as in the rivers, there is an abundance of fish. The chief streams are the Red River, the Assiniboine, the Souris, and the Winnipeg. Except in the region of the Riding Mountains, between Lake Manitoba and the Assiniboine, the land is very level and comparatively treeless. The first railway was opened in 1879, and since 1885 Manitoba has had the benefit of the Canadian Pacific. Free grants of land are offered to suitable settlers by the Government, and there is still room for agricultural development. Large game is beginning to get scarce; but the chief wild animals and birds are protected by close times. [CANADA.]

Manitou, a term used by the North American Indians to denote a deity or spirit. Their religion is dualistic, and they recognise a Good and an Evil Spirit, with numerous lesser divinities. The name is also applied to the patron-animal of an individual.

Manna, an exudation from the stem of the so called "flowering" ash of southern Europe, *Fraxinus Ornus*, collected in the dry weather of July and August, in Sicily, from incisions in the stems of trees eight years old and upwards. A hectare ($2\frac{1}{2}$ acres) planted with 4,000 to 5,000 trees yields nearly 200 lbs. of manna. It contains 70 to 80 per cent. of *mannite*, $C_6H_8(OH)_6$, a sugar-like substance crystallising in rhombic prisms. Manna is used as a mild aperient for children. Somewhat similar substances are *oak manna*, produced on *Quercus Vallonia* and other oaks in Kurdistan, by the puncture of an insect; *Briançon manna*, on the leaves of the larch; *Alhagi manna*, from the leguminous *Alhagi camelorum* of Afghanistan, Beluchistan, and Persia; *tamarisk manna*; and *Australian manna*, from the leaves of *Eucalyptus viminalis*.

Mannheim, a town in Baden, is situated on the right bank of the Rhine just south of its junction with the Neckar. In 1606 a castle was built here by the Elector-Palatine, and the town was for many years the capital of the Palatinate. It suffered greatly during the Thirty Years' War, was destroyed by the French in 1689, and bombarded by the Austrians in 1795. It has now ceased to be a fortress, and has become instead a river-port and a manufacturing town. A fine palace was built here by the Elector-Palatine in 1720-29. The Schiller-platz contains a colossal statue of the great poet.

Mannheim Gold, an imitation gold alloy consisting of copper, zinc, and tin in the proportions 6, 2, and 1 respectively.

Manning, HENRY EDWARD, CARDINAL (1808-92), son of William Manning, M.P., was born in Hertfordshire. He took a first class both in classics and mathematics from Balliol College, Oxford, and was elected fellow of Merton. In 1834 he became rector of Lavington, Sussex, and in 1840 Archdeacon of Chichester. He had been a strong Tractarian at Oxford, and in 1851 (largely in consequence of the Gorham judgment) he seceded to the Roman Church, and published his *Grounds of Faith* in the next year. In 1865 he succeeded Wiseman as Archbishop of Westminster, and was named a cardinal ten years later. Supporting as he did the extreme claims of the Papacy, he was in much greater favour at Rome than Newman. In his later years he was prominent in social movements, such as the Dockers' strike in London in 1889, and in the temperance movement.

Manobos, an Indonesian people of the Philippine archipelago scattered in small groups over the island of Mindanao; are still mostly pagans, living, not in tribes, but in little family circles often consisting only of the *bagani* (chief) and his

brothers with their wives and children. Some are agriculturists, growing maize, rice, and tobacco, while others are hunters and fishers, supplementing the produce of the chase with roots, reptiles, and fruits. The type differs greatly from that of the surrounding Malayan populations, and presents a striking resemblance to that of the Eastern Polynesians; hence the Manobos must be classed as Indonesians (q.v.). They are the most powerful and ferocious of all the Mindanao wild tribes, and the term Manobo is often applied by the Spanish writers in a general way to all the unreduced heathen populations of the Mindanao highlands. (Blumentritt; Montano, *Voyage aux Philippines*.)

Man-of-War Bird. [FRIGATE-BIRD.]

Manometer is an instrument used for measuring the pressure of a gas enclosed in a definite space. A simple form of the instrument consists of a box containing mercury; through the air-tight cover of the box passes a tube into the mercury, the upper end of the tube being open to the air. The vapour whose pressure is to be measured enters the box by another inlet, and if its pressure is greater than that of the air, mercury is forced up the tube, the height to which it rises indicating the pressure of the vapour. The change of form of a metallic tube, when filled with gases of different pressures, is the principle upon which *metallic* manometers work.

Manor, a district of ground held by great personages. The modern English manor derives its origin from subinfeudation, as it existed before the modifications of the system of tenures introduced by Magna Charta, and the still more important alterations made in the years 1290 and 1324, by which the granting land in fee simple, to be held by the grantee as tenant or vassal to the grantor, was in effect prohibited. A manor by reputation, however, but which has ceased to be a legal manor, may yet retain some of its privileges as a preserve for game, and the lord may still appoint a game-keeper thereto. [COPYHOLD, FEUDAL SYSTEM.]

Mans, LE, chief town of the department of Sarthe, France, stands on the left bank of the Sarthe river, 80 miles W. of Orleans. It is a historical city, the former capital of Maine, and the birthplace of Henry II., the Anglo-Angevin king. In modern times it has been the scene of a massacre of Vendéans in 1793 and of a great French defeat in 1871. Its cathedral is celebrated for its beautiful stained glass and fine 13th-century Gothic choir. In it is a monument to Berengaria, wife of Richard I. of England. There is a large poultry trade and candle manufacture.

Mansel, HENRY LONGUEVILLE (1820-71). Dean of St. Paul's, was born in Northamptonshire and educated at Merchant Taylors' and St. John's College, Oxford. He was successively Reader in Moral Philosophy, Waynflete Professor, Professor of Ecclesiastical History, and Canon of Christ Church at Oxford, and in 1869 became Dean of St. Paul's. His Bampton lectures, *The Limits of Religious Thought*, may be best remembered from

a famous protest by J. S. Mill (*On Hamilton*). In 1849 he had published an edition of Aldrich's *Logic*, which was long in use; and his chief metaphysical works were *Prolegomena Logica* (1851), and *The Philosophy of the Conditioned* (1866). He was also successful in light literature and parody, and had a brilliant reputation as a talker.

Mansfeld, PETER ERNEST, second count, was the natural son of COUNT PETER MANSFELD, the general of the Emperor Charles V. and governor of Luxemburg and afterwards of the Spanish Netherlands. Peter Ernest the younger, though legitimated by Rudolf II., was not given possession of his father's lands. He therefore left the imperial service, joined the Reformed Church, and became one of the leading Protestant generals in the Thirty Years' War, previous to which he helped the Duke of Savoy against Spain. Driven out of Bohemia, he for some time carried on guerilla warfare in the Palatinate, and defeated Tilly in 1622. Subsequently he took service with the Dutch, but in 1624 reappeared in Germany with an army which had been raised mainly in England. His career, however, being checked by the victory of Wallenstein at the bridge of Dessau (1626), he tried to join Bethlen Gabor, Prince of Transylvania, but was unable to obtain supplies to carry on the war. He died at Racowitza, in Bosnia, at the end of the same year.

Mansfield, WILLIAM MURRAY, EARL OF (1705-93), was a son of the fifth Viscount Stormont. He left Scotland in his fourteenth year for Westminster school, whence he was elected to Christ Church. In 1730 he was called to the bar, and first acquired a name by his defence of the city of Edinburgh in the matter of the Porteous riots. In 1742 he became Solicitor-General, and twelve years later first law officer and leader of the House of Commons; but in 1756, by accepting the Chief Justiceship he abandoned a purely political career. None the less he sat in every cabinet till 1783, and was the chief defender in the House of Lords of Lord North's Government. He was created Baron in 1756, and Earl in 1776, but twice refused the Chancellorship. As a judge Mansfield is regarded as the founder of commercial law. In 1788 he resigned the Chief Justiceship, and died five years later.

Manslaughter, a criminal offence, and defined as homicide felonious, but without premeditation, and it may be either (1) involuntary, as where a man, doing an *unlawful* act not amounting to felony, by accident kills another, or where by culpable neglect of duty he occasions another's death; or, (2) voluntary, as when, upon a sudden quarrel, two persons fight and one of them kills the other, or where a man greatly provokes another by some personal violence and the other immediately kills him. Both classes of the crime constitute felony, and are punishable, at the discretion of the court, by penal servitude for life or for not less than three years, or by ordinary imprisonment or by a fine.

Mantegna, ANDREA (1431-1506), a great Italian painter, was born in the neighbourhood of Padua, and adopted by Squarcione. At the age of seventeen he set up a studio on his own account, and studied classical models with great assiduity. He left Padua in 1459, leaving behind him many examples of his best work, and went to Verona, where he painted a Madonna in the church of St. Zeno. He afterwards lived chiefly at Mantua, where the marquis was his patron. Mantegna's masterpiece, *The Triumph of Caesar*, is at Mantua; he was knighted by Gonzaga on its completion. Besides being celebrated for his great mastery of perspective and foreshortening, this painter will be remembered as having introduced into northern Italy the art of engraving on copper.

Mantell, GIDEON ALGERNON (1790-1852), the Sussex geologist, was born at Lewes. He practised as a surgeon at Lewes, Brighton, and Clapham, devoting his leisure to scientific work. He was awarded medals by the Geological and Royal Societies for his discovery and description of the Dinosaurian reptiles, iguanodon, hylæosaurus, Pelorosaurus, and Regnosaurus, and was the author of *Fossils of the South Downs* and *Wonders of Geology* (1833), a highly popular work. He was also an able lecturer.

Manteuffel, EDWIN HANS KARL VON, Field Marshal (1809-85), a great German general and diplomatist, was born at Dresden and brought up with his cousin Otto von Manteuffel, the statesman (q.v.). He entered the army in 1827, and in 1848 was one of the chief diplomatic as well as military advisers of Frederick William IV. of Prussia. In 1857 he became chief of the Military Cabinet, took part as lieutenant-general in the Danish campaign of 1864, and, as governor of Schleswig, drove the Austrians from Holstein in 1866. He next commanded with success the army of the Main, and at the end of the war with Austria went on a special mission to St. Petersburg. In October, 1870, he succeeded Steinmetz as commander of the First Army in the war with France, and after the victory of Amiens (November 27) occupied Rouen. Early in 1871 he was placed at the head of the Army of the South, and as such drove Bourbaki into Switzerland. He next commanded the Second Army Corps, and finally was for two years head of the Army of Occupation. In 1879 Field Marshal Manteuffel was named governor of Elsass-Lothringen.

Manteuffel, OTTO THEODOR VON (1802-82), a Prussian statesman, was cousin of the Field Marshal. After holding various important legal offices, he in 1847 became Prussian Minister of the Interior. He was the chief opponent of the revolutionists; but his name is chiefly remembered for his mistake in giving way to Austria at Olmütz in 1850, by which the transference of the German supremacy to Prussia was delayed for several years. His career closed eight years later, when Frederick William IV. became insane.

Mantua (Italian, *Mantova*), an ancient Italian city, is situated on a peninsula in the

Mincio, 25 miles south of Verona. It has an eventful history, having passed from Rome to the Ostrogoths, from them to the Lombards, becoming next a fief of the Empire under the Marquis of Canossa and the Duke of Lorraine. Matilda of Tuscany wrested it from the Empire, and after her death Mantua was an independent member of the Lombard League, till the Gonzagas attained power. In the 18th century the city again came under imperial power, and though captured by Napoleon in 1797 and restored in 1801 after its recapture, it remained Austrian till 1866. Mantua was the birthplace of Virgil and Mantegna, and contains noble memorials of the skill of Giulio Romano as architect and painter. It has also a fine library and an academy of arts and sciences. Its situation on a sluggish river, and amid swamps and stagnant pools, renders it very unhealthy, but makes it the strongest fortress in Italy.

Mantze, a Chinese term meaning "untameable worms," applied in a general way, in the sense of "barbarous" or "wild," to the hill tribes especially of the southern and south-western provinces. In 1877 Lieutenant Gill visited the Sumu, a large nation called by the Chinese "White Man-tze," who formed a confederacy of 18 groups recognising a king or lord paramount, and reaching from west Yunnan to the extreme north of Sechuen. They wore the Chinese dress and conformed to Chinese customs, but spoke a language "resembling Sanskrit" (?). These are in no sense "wild;" for they carefully till the land, weave textiles, build houses and towers in the Tibetan style, have schools for their children, and even possess books in Tibetan and Chinese characters.

Manu ("Thinking Being"), the traditional author of the great sacred book of the ancient Hindus and of an ancient work on Vedic rites. In Hindu mythology there are a succession of Manus, each of whom created the world anew. The law book contains the whole duty of man in all his relations in 12 books. The date of its compilation is now placed between the 2nd century B.C. and the 2nd century of the Christian era. The first English translation was made by Sir William Jones.

Manual. [BREVARY.]

Manucode, any bird of the genus *Manucodia*, from the Papuan sub-region, classed with the Birds of Paradise (q.v.), though some authorities place them with the crows. The plumage is a glossy steel-blue, and there are no accessory plumes.

Manx, the natives of the Isle of Man, who are Celts of the Gadhælic (Irish) branch, with a large infusion of Norse blood. The Manx language is a pure Gadhælic dialect, apparently more allied to the Erse than to Irish. Till about the year 1600 it was spoken exclusively, but since then English has made steady progress, and in 1871 of a total population of 53,765 only 190 spoke Manx alone, 13,000 Manx and English, all the rest English. At present it is mainly confined to the Bride, Gurby, and Arbory districts, this last being the only place where it is still used in the pulpit. The literature consists mainly of some religious treatises and a few ballads, dating from the 16th century.

Manzoni, ALESSANDRO, CONTE DI (1785-1873), a great Italian writer, was a native of Milan and a grandson of Beccaria. He was educated at Pavia, and spent some years at Paris before his marriage. After losing the greater part of his property, he returned to Milan. His literary career was short, but fruitful. It began with the publication of some hymns of great beauty. *Il Conte di Carmagnola*, a tragedy published in 1819, was attacked by the *Quarterly Review*, but defended by Goethe. It was followed by *Adelchi*; by *Il Cinque Maggio*, an ode on the death of Napoleon I.; and, above all, by the romance *I Promessi Sposi* (1827). Manzoni also wrote *Observations on Catholic Morality*, translated into English as *A Vindication of Catholic Morality*. In 1860 the great writer was named a senator of Italy, and helped to draw up a scheme for the merging of dialects in a national language.

Maori (i.e. "native," "indigenous"), the aborigines of New Zealand, who are the southernmost group of the Eastern Polynesians, apparently most nearly related to the Rarotonga islanders, but evidently with a strain of black blood derived perhaps from a Melanesian element existing in the archipelago before their arrival some 600 or 700 years ago. At the time of the discovery (1769) they were estimated at from 300,000 to 500,000, mostly concentrated in the North Island, for in the South Island they were never very numerous. Since contact with Europeans, the Maori, like all other Polynesians, have continued steadily to decline, falling in 1840 to 115,000, in 1857 to 56,500, and in 1891 to 42,000, including half-breeds. These are now mainly confined to the King Country in the North Island, which may be regarded as a sort of reservation, some 10,000 square miles in extent, secured to the natives by treaty rights. If not the finest, the Maori are certainly the most vigorous and energetic, of all the South Sea islanders, with strong, muscular frames, regular features formerly disfigured by elaborate tattoo markings, black, crispy hair, olive brown complexion. They are naturally intelligent, with some knowledge of medicine and even of astronomy, good musicians, skilful carvers in wood, great orators, brave and warlike, although since their final reduction by the English in 1869 they have never ventured to renew the struggle for independence. Their literature, purely oral, is rich in poetry, national songs, folk-lore, legends, and traditions, and much of these materials has been committed to writing by European students. The Maori were formerly polytheists, worshipping many deities besides the *atua* or Supreme Being; yet there were neither temples nor idols, nor a cult in the proper sense, the so-called *tohunga* or "priests" being rather soothsayers and wizards, charged also with the preservation of the national myths, songs, and legends. The people were undoubted cannibals, and the practice is even said still to exist, although nearly the whole nation has for some years been Christian, evangelised by Protestant missionaries, whose first station was founded in 1814 at the Bay of Islands in the North Island.

Map, or MAPES, WALTER, the creator of the Arthurian legend in its modern form, was perhaps

a native of Herefordshire. After studying at the university of Paris, he rose rapidly at the Court of Henry II., was a justice itinerant in 1173, and became Archdeacon of Oxford in 1196. He appears to have been equally in favour with Richard I. and John, but when he died we do not know. Map wrote in French the *Quest du Saint Graal*, and probably also the *Saint Graal*, and great part of *Lancelot du Lac*. In Latin he wrote an anecdotal work, *De Anecdosis Curialium*, and the satirical poems, *Goliath Episcopus* and the rest, have often been ascribed to him. He was the friend of Becket and Giraldus Cambrensis.

Maple, the English name for the trees of the genus *Acer*, which gives its name to the sub-order *Acerineæ* of the order *Sapindaceæ*. It includes about 50 living species, natives of the Northern



MAPLE (*Acer campestre*).

Hemisphere, and 19 species have been described as occurring fossil in the Miocene rocks of Oeningen. The maples are trees or shrubs with opposite, palmately-lobed leaves; inconspicuous flowers in polygamous clusters; and double or two-winged samaræ (q.v.) as fruits. The leaves of both fossil and recent maples are commonly blotched with black spots caused by a fungus, *Rhytisma*. The wings of the samara vary much in size and in shape, being oblong in the common maple and more rounded and less divergent in others. They are rotated by the wind as the fruit falls, like a screw-propeller, and thus disperse the seed to some little distance from the parent tree. *A. campestre*, the only British species, often only a hedgerow shrub, affords excellent charcoal and a wood susceptible of high polish and sometimes beautifully mottled, which was formerly used for *mazer-bowls*. *A. pseudo-Platanus*, the sycamore, a handsome European tree much grown in Britain since the 16th century, and the allied *A. platanoides*, the Norway maple, introduced at the end of the 17th century, have fine-grained, white wood, largely used in turnery. *A. saccharinum*, the sugar or rock maple, and *A. rubrum*, the scarlet maple, natives of North America, yield a sap, from which *maple sugar* is still extensively prepared in the north-eastern United States and Canada. The wood of the latter, in old trees, has a wavy grain known as *curled maple*, and that of the former varies, producing both *blister* and *bird's-eye maple*, which are much

prized for inlaying. *A. palmatum* and several other Japanese species are in cultivation, which, like *A. rubrum* and our own maple, are remarkable for the autumn tints of their foliage. Those American and Japanese trees, which differ in having pinnate leaves, are now separated as the genus *Negundo*. A variegated form of *N. fraxinifolium* is a favourite tree in gardens.

Marabou. [ADJUTANT.]

Marabouts, a race of Mohammedan priests or saints in North Africa, who carried on the traditions of the Morabits (q.v.).

Maracaibo, a town in Venezuela, stands on the west side of the entrance of Lake Maracaibo. The town has a fine appearance, and is fortified, but is unhealthy. A great deal of coffee is exported. The exports chiefly go to the United States, but Great Britain has a large share in the imports. The Gulf of Venezuela, separated by a narrow strait from Lake Maracaibo, is sometimes known as the Gulf of Maracaibo.

Maranham, or MARANHÃO, the name of a maritime province and its capital in Brazil. The latter is situated on an island, and has a cathedral and bishop's palace built by the Jesuits. Cotton and sugar are exported, and manufactured goods taken in return, chiefly from Great Britain. Lord Cochrane, who captured the place in 1823, received the title of Marquis of Maranham.

Maraschino, a liqueur obtained by the distillation of a fine growth of cherry (*Marasca*) obtained chiefly in the neighbourhood of Zara in Dalmatia.

Marat, JEAN PAUL (1742–93), was born near Neuchâtel. Marat took very little interest in politics until the eve of the Revolution, but like his father followed the profession of medicine. He had, however, very early read and admired Rousseau. He came to England probably about 1770, and lived there some 10 years. He practised some time as a fashionable doctor while living in Church Street, Soho, and was in 1775 created M.D. of St. Andrews. The unorthodoxy of his scientific views prevented the Académie des Sciences from admitting him to membership, and from March, 1789, when he published his *Offrande à la Patrie*, Marat was a politician only. Later in the same year he wrote a pamphlet against the English Constitution, and in September his journal, *L'Ami du Peuple*, began to appear, and soon exercised a considerable influence. Lafayette endeavoured to suppress it in the following year, and Marat had to flee the country, and even when he came back to pass many days in the sewers of Paris. He had no party or even personal friends in the Convention, to which he was elected by Paris, but was supported by the mob. He was largely responsible for the September massacres, and the last year of his life was a successful struggle with the Girondins, whose war policy he had denounced. He was sent before the Revolutionary Tribunal and tried on April 22, 1793, but acquitted, and the Girondins never recovered their defeat. On July 13th he was assassinated by Charlotte Corday (q.v.).

Marathon, perhaps identical with the modern Marathona, was a small town in a plain to the north-east of Athens, between the mountains and the sea. In history it is famous as the scene of the victory of Miltiades over the Persians in 490 B.C.; in mythology as the scene of the earliest worship of Apollo, and of several incidents in the Heracleian and Theseid legends.

Maravars, an outcast people, South India, in Madura and from Ramnad to Cape Comorin; are of extremely dark complexion, and although now speaking a Tamil (Dravidian) dialect, are not Dravidians, but survivors of the aboriginal Negrito population of India. (E. Callamand, *Tribes des Mararas*, in *Revue d'Anthropologie*, 1878.)

Maravi, a historic people of South Africa, who formerly held a dominant position in the region south-west of Lake Nyassa. They are mentioned in the missionary reports of the 17th century, and they figure on D'Anville's map, and the great *Lake Maravi* known at that time by hearsay, and since identified with Livingstone's Lake Nyassa, was named from them. Later they were driven from most of their territory by the Maviti, Angoni, and other Zulu invaders, and in 1863 Livingstone found them confined to the Deza plateau, near the south end of Nyassa. Since then they have almost disappeared altogether, although in 1884 Consul O'Neill heard of a broken Maravi tribe in the Mihawani district, south-east of the Namuli highlands. They appear to be a Bantu people belonging to the same stock as the present Manganjias. (Livingstone, *Last Journal*.)

Marble is a term strictly applied to any limestone susceptible of polish, though often inaccurately extended to alabaster, serpentinite or granite. Marbles are generally partly or completely crystalline in texture, the latter—such as the white marble of Carrara—being known as *saccharoid*. The beauty of many varieties depends upon the presence of fossils in them, as in the *madrepore* marbles with fossil corals in the Devonian rocks, the *encrinital* and *bird's-eye* marbles of the Carboniferous rocks of Bristol and Derbyshire and the fresh-water *Paludina* marbles of Purbeck and Sussex made up of the snail-shells now known as *Triparus*. The more completely crystalline marbles owe their texture to metamorphic action, known technically as *marmorosis*. This may be due to the heat from contact with igneous rocks or pressure. The white statuary marble of Carrara, in Tuscany, used by Michelangelo and Canova, and imported as "Sicilian" marble, is that employed by modern sculptors. Its age is variously stated as Carboniferous, Triassic and Liassic. From the same source comes the grey-veined marble, known in Italy as *bardiglio*. Somewhat similar are the marbles of Mount Pentelicus, in Attica, used by Phidias and Praxiteles in the Parthenon, as seen in the Elgin marbles in the British Museum; and of the island of Paros, represented by the Venus de' Medici. *Black marble* is obtained from Carboniferous rocks at Ashford, Derbyshire, and various places in Ireland.

It contains bituminous matter and is, therefore, known mineralogically as *anthracomite*. True red marble is uncommon, some of the rocks so called being porphyritic felsites. Green marbles such as *verd antique*, *Irish green* marble from Connemara, and *Mona marble* from Anglesey, are *ophicalcites*, or mixtures of serpentine and limestone of metamorphic origin. *Landscape* or *Cotham* marble, from the White Lias of the Rhætic series near Bristol, is a dull grey clayey limestone, with tree-like markings produced by infiltrated oxide of manganese. Algerian and Mexican onyx or *onyx-marble* is a translucent brownish and yellowish stalagmite (q.v.) formed by the evaporation of carbonated water, the alabaster of the ancients being a similar stone.

Marburg, a town in Hesse-Cassel, situated on the left bank of the Lahn, about midway between Cassel and Coblenz. Here St. Elizabeth of Hungary, wife of the landgrave of Thuringia, died in 1231, and in the 15th and 16th centuries it was generally the capital of the landgraves of Hesse. Here also Luther and Zwingli conferred in 1529, in the hall of the great Schloss or Castle, which was even then more than 300 years old. Two years before Marburg University had been founded by the Protestant Landgrave Philip. The city is distinguished architecturally by a fine specimen of early Gothic, the Elisabethenkirche, built by the Teutonic Order to contain the tomb of St. Elizabeth. It is also celebrated for its pottery.

Marcantonio Raimondi, the great Italian engraver, who is usually known only by his Christian name, was born towards the close of the 15th century at Bologna. Here until 1510 he chiefly lived as a goldsmith and engraver in the workshop of Francia. From this time till it was taken by the Spaniards in 1527 he lived at Rome, and engraved many of the best pictures of Raphael and Giulio Romano. It is probable that he died at Bologna a few years later. Besides his designs after Raphael, Marcantonio engraved a portion of the design of Michelangelo's *Battle of Anghiari*, and executed engravings in copper from Dürer's *Life of the Virgin* and *Little Passion*.

Marcasite was formerly used to denote any mineral which possessed a high lustre and metallic appearance, especially those now called pyrites. Bismuth was also known under the name of marcasite. It is now confined to a mineral sulphide of iron of the same composition as iron pyrites, FeS_2 , from which, however, it differs in forming crystals belonging to the rhombic system, iron pyrites crystallising in cubes.

Marceau, FRANÇOIS DESGRAVIERS (1769–96), a young French general of great promise, was a native of Chartres. In 1792 he distinguished himself in the defence of Verdun. He next served with distinction in La Vendée. At the victory of Fleurus he commanded the right wing of the republican army. He was killed at Altenkirchen in September, 1796, when in command of the first division of the army of the Rhine.

Marcellus, MARCUS CLAUDIUS, a Roman general who was five times consul. In 222 B.C. he

won for the last time the *Spolia opima* by killing with his own hand Viridomarus, King of the Insubrian Gauls. His next exploit was the saving of Nola from Hannibal after Cannæ. During the second Punic War he also reduced Syracuse by blockade and conquered Sicily. During his last consulship he was killed in a skirmish with Hannibal near Venusia (208 B.C.), at which place he had fought an indecisive battle in the preceding year.

Marcellus II., Pope of Rome, as Cardinal Cervini presided over the Council of Trent. He was elected to the Papacy in April, 1555, but died three weeks later. He was the only Pope who retained his Christian name in his Papal title. To him is dedicated Palestrina's famous Mass.

Marcet, JANE (1769-1858), the author of *Conversations on Chemistry*, *Conversations in Political Economy*, and similar popular manuals published at the beginning of the century, was born at Geneva, and married a doctor there, with whom she came and lived in London. She wrote also *Stories for Very Little Children*.

March, the first month of the ancient Roman year, *Martius (mensis)*, sacred to Mars, god of war, and the third month of the later Roman (Julian) and English year. In this month the sun leaves the sign of Pisces and enters that of Aries.

Marcion, founder of a sect of Christian ascetics, in the 2nd century, was a shipowner at Sinope. About the year 139 he came to Rome, and, being unable to find acceptance for his peculiar doctrines, headed a schism five years later. When he died, some 20 years after, numerous branches of the sect had been formed in all parts of the Roman Empire, and for five centuries the leading fathers of the Church wrote much in refutation of its doctrines. The main feature of these was the interpretation of Pauline doctrine as conveying the existence of two gods, the god of the Old Testament, who represented stern justice, and that of the New, redemption and mercy. In the speculations arising from this some confusion became apparent. [MANICHÆANS.]

Maremma (corruption of *Maritima*), a marshy region of Tuscany, extending along the coast from the river Cecina southwards. It was once fertile and populous, but is now haunted by malaria, though crops are now again being grown and pasture is good.

Marengo, a village three miles S.E. of Alessandria in eastern Piedmont, which was the scene of a great battle on June 14, 1800, between Bonaparte and the Austrians. Though generally claimed as one of Napoleon's greatest victories, it was the cavalry charge of Kellerman which really retrieved what had almost become a disaster.

Mareotis, LAKE, now called EL MARIÛT, a brackish lake in northern Egypt, separated from the Mediterranean by a narrow strip of land, on which part of Alexandria is situated. It is 40 miles long and 18 broad. It was once navigable, but has frequently so far dried up as to be no more than a marsh, as in 1882.

Margaret, Queen of Denmark, Norway, and Sweden, was born in 1353, and in 1375 was chosen as successor to her father, Waldemar IV., on the Danish throne. On the death of her husband, Hacon VIII., she also became sole ruler of Norway, and in consequence of an invitation from the Swedish nobles she invaded their country and wrested the crown from Albert of Mecklenburg. In 1396 Eric of Pomerania, Margaret's grand-nephew, became titular king of the three countries. the Union of Colmar in the following year making Scandinavia one kingdom. Margaret, however, really directed affairs till the last, and added Lapland and Finland to her dominions.

Margaret, Queen of Scotland, was born about 1050 in Hungary, and educated under Lanfranc at the Court of Edward the Confessor. Two years after the Norman Conquest she took refuge in Scotland, and was married by Malcolm Canmore in 1069. The young queen was a great civilising influence. She built a church at Dunfermline, and was active in introducing the practices of the Latin Church into her realm. She died in 1093, and was canonised in 1250. Three of her sons became kings of Scotland, and one of her daughters, Matilda, married Henry I. of England.

Margaret of Anjou, Queen of England, daughter of René of Anjou, titular king of Naples and Jerusalem, was born in a town in Lorraine in 1429. In 1445 she was married to Henry VI. of England; Anjou and Maine were to be ceded to René. Margaret, supported by Suffolk and Somerset, came into violent conflict, first with the Duke of Gloucester, and afterwards with Richard, Duke of York. After the death of Somerset at St. Albans she became herself the strongest force on the Lancastrian side, and in 1460 she succeeded in defeating York at Wakefield and the Earl of Warwick at the second battle of St. Albans. The defeat of Towton, however, obliged her to flee to Scotland and, after the disasters which succeeded it, she retired to Lorraine for six years. In 1470 it was agreed that Warwick's daughter should marry her son, but Barnet and Tewkesbury destroyed their hopes. Margaret was ransomed from prison by the French king, and died in France in 1482.

Margaret of Navarre (MARGUERITE D'ANGOULÊME), sister of Francis I. of France, was born in 1492. She was married, first to Charles, Duc d'Alençon, in 1509; secondly, in 1527, to Henri d'Albret, King of Navarre. By the latter she had a daughter, Jeanne d'Albret, who became mother of Henri IV. Marguerite was a champion of Protestantism and a great patron of men of letters. She was the author of some interesting letters, of some poems, *Les Marguerites de la Marguerite*, and the *Heptameron* is usually attributed to her. She died in 1549.

Margaret of Valois ("LA REINE MARGOT"), great-niece of Margaret of Navarre and daughter of Henri II. and Catharine de Medici, was born in 1553. She was married to Henri of Navarre (Henri IV.) on the eve of St. Bartholomew, and soon became celebrated for her beauty and

licentiousness. On the accession of her husband to the throne of France he divorced her, but afterwards frequently consulted her. Marguerite de Valois died in 1615, leaving behind her some well-written memoirs.

Margaric Acid is an organic fatty acid of the composition $C_{17}H_{34}O_2$. It forms a white crystalline mass, which melts at about $60^\circ C.$, and in its properties closely resembles palmitic acid. It forms salts termed *margarates*. It is doubtful whether it really occurs in the natural fats, though it is usually stated to be a constituent of *margarine* (q.v.).

Margarine, a solid mass which can be obtained from a large number of oils and fats, *e.g.* olive oil, goose grease, lard, butter, etc. It may be crystallised, and so forms colourless needles melting at $49^\circ C.$ Chemically it consists, like all fats, of a compound of glycerine with one or more organic acids, probably chiefly palmitic and stearic.

Margate, an English watering-place, in the Isle of Thanet district, on the North Foreland, 66 miles east of London. It has two fine churches, a deaf-and-dumb asylum, and a sea-bathing infirmary, and is much resorted to by Londoners. The pier is 300 yards long, and there is a jetty of still greater length. Margate is a corporate town.

Maria Christina. [CHRISTINA MARIA.]

Maria Louisa, Empress of France, was the daughter of Francis I. of Austria. She was born in 1791, and in 1810, after Wagram, was given in marriage to Napoleon. Next year she bore a son, who was called King of Rome. During her husband's absence with the army she was Regent of France. On the abdication of Napoleon in 1814 she retired to Vienna, and contracted a morganatic marriage with Count Neipperg, by whom she had three children. In 1816 she was put in possession of the duchies of Parma and Placentia, and Guastalla, but was driven out by a rising in 1831. She was subsequently restored by the Austrians, but died at Vienna in 1847. The king of Rome (or Napoleon II.) died in 1832.

Mariana, JUAN DA (1536-1624), the Spanish historian, was born of humble parents at Talavera de la Reina. He entered the Society of Jesus at an early age, and afterwards taught at Jesuit colleges in Rome, Sicily, and Paris. In 1574 ill-health compelled his retirement to Toledo, where he gave his remaining years to literary and historical writing. His two great works were his *Historiæ de Rebus Hispaniæ*, which he himself translated into Spanish, in which the history of Spain to the year 1621 was contained; and the treatise *De Rege et Regis Institutione* (1599), in which was maintained the lawfulness of deposing kings. The latter was condemned by the General of the Jesuits, and Mariana's *Seren Theological and Political Tractates* (1609) were placed upon the Index Expurgatorius, the author also being imprisoned by the Inquisition.

Maria Theresa, Queen of Hungary and Bohemia and Empress of Germany, daughter of the

Emperor Charles VI., was born in 1717. In 1736 she was married to Francis of Lorraine, who a year later became Grand Duke of Tuscany. In 1724, on the death of her brother, Charles VI. declared her heir to his hereditary dominions, and he spent the last few years of his life in unceasing efforts to secure her peaceful succession by obtaining guarantees of the Pragmatic Sanction from the different Powers. Notwithstanding, when he died, in 1740, Frederick the Great invaded Silesia, Charles Albert of Bavaria contested the will of the late emperor, while Saxony and Spain also advanced claims, and France supported Bavaria in return for a free hand in the Netherlands. Maria Theresa rose to the occasion, and obtained the support of the Hungarians by granting them constitutional privileges and the right of carrying arms. The secret convention of Klein-Schnellendorf was made (October, 1741) with Prussia by English mediation, by which Lower Silesia was ceded. Less than two months later, however, it was shamelessly broken by Frederick, and next month the Elector of Bavaria was elected emperor instead of Maria Theresa's husband. She, however, succeeded in preserving all her territory with the exception of Silesia, the whole of which was ceded to Prussia at the peace; and after the death of Charles Albert (1745) the Grand Duke Francis was elected his successor in the empire, with the title of Francis I. The next few years saw the rise of Kaunitz (q.v.), and a complete revolution in European politics. In the Seven Years' War, though Frederick began hostilities, he was forced to do so on account of the schemes of revenge which he knew that Maria Theresa (this time with France, Russia, and Saxony as her allies) was forming against him. After nearly seven years of terrible battles, Austria was obliged to make peace in 1763 without having regained the territory lost in the last war. Two years later Maria Theresa's son Joseph was elected to the empire in succession to his father; and from this time till her death in 1780 he shared the rule of the Austrian territories with her. Almost to the last she kept control of home affairs. [AUSTRIA, FREDERICK II., JOSEPH II., KAUNITZ.]

Marie Antoinette, JOSÈPHE JEANNE, Queen of France, was the fourth daughter of Maria Theresa and the Emperor Francis I. She was born in 1755, and in 1770 was married to Louis, Dauphin of France, who became Louis XVI. four years later. Marie Antoinette was expected to watch over Austrian interests in France, and was carefully tutored by Maria Theresa on that subject, and also on her own conduct. On account of her position in this respect, and of the heedlessness of her life, she had become very unpopular before the Revolution. Though guiltless in the affair of the diamond necklace [ROHAN, CARDINAL DE], the belief in her guilt was widespread, and the company she kept made all appearances tell against the purity of her life. In home politics she procured the dismissal of Turgot, and, though she tried to keep Necker in office in 1781, her friends thwarted his most important measures. The birth

of her children raised up bitter enemies to her in Orleans and his party, who did all they could to ruin her in public opinion. Marie Antoinette induced Louis to take the fatal steps of the attempted *coup d'état*, which led to the taking of the Bastille, and the still more fatal flight to Varennes. By her, too, he was prevented from giving full confidence to either Mirabeau, or Lafayette, or to the moderate Jacobins. Marie Antoinette was imprisoned with her family in the Temple after the proclamation of the republic in August, 1792, but she was afterwards separated from her children and sent to the Conciergerie. In October, 1793, several months after the death of her husband, she was brought before the revolutionary tribunal, and was guillotined on the 16th in the flower of her life. [LOUIS XVI., MIRABEAU, ETC.]

Marie de France, a writer of poetry in a Norman-French dialect, is supposed to have lived in England at the beginning of the 13th century. Her works first consist of fourteen *Lais*, or narrative poems, in octosyllabic metre; secondly, of 103 fables (*The Ysopet*), which were translated from Latin into English by Henry III., and thence into French by Marie herself, "for the love of Count William, the most valiant of this realm," who has been identified with William Longsword of Salisbury; thirdly, of a poem of over 2,000 lines descriptive of the purgatory of St. Patrick.

Marie de' Medici, second wife of Henri IV. and daughter of Francis I. of Tuscany, was born in 1573 and married in 1600. Next year she gave birth to a dauphin, afterwards Louis XIII., but not long after separated from her husband. From 1610 to 1617 she was regent for her son, but in the latter year was deposed, the influence of Concini, Marquis d'Ancre, with her having excited universal displeasure. After an absence of two years she reappeared at Court, and soon began to intrigue against Richelieu, but her devices having been discovered, she was imprisoned at Compiègne. She escaped to Brussels in 1631, and died at Cologne in 1642. The Luxemburg Palace was built by her.

Marienbad, a watering-place in the north-west of Bohemia, about 18 miles south of Carlsbad. The salt springs, which are cold and aperient, were used by no one not living in the locality until the first decade of the 19th century. They belong to the neighbouring abbey of Tepl. The place is now much resorted to both for external and internal treatment, and many bottles of the water are exported. There is a theatre here, and an English church.

Marienburg, a Prussian town 30 miles S.E. of Dantzig, stands on the Nogat, an affluent of the Vistula. The Teutonic Knights built a castle here in 1274, and from 1309 till 1457, when it fell into the hands of the Poles, it was their headquarters. Frederick the Great added it to Prussia by the first partition. The Marienburger Schloss, which was restored in the first half of the 19th century, is one of the most interesting Gothic buildings in Europe.

Mariette, AUGUSTE FERDINAND FRANÇOIS (1821-81), called MARIETTE PASHA, was born at Boulogne, and educated there and at Douai. After

a short time spent in England, he became professor at Boulogne Municipal College, and through having been entrusted with the papers of his cousin, Nestor l'Hôte, he began to study Egyptology. In 1849 he was given an appointment in the *musée* at the Louvre. In the following year he was sent to Egypt by the Government to discover Coptic MSS., and spent the rest of his life there, with the exception of the years 1854 to 1857, when he published the results of his recent discoveries. On his return he was made inspector-general of Egyptian monuments. In 1863 he became director of the museum at Boulak (now Gizeh), and next year published *Aperçu de l'Histoire d'Égypte*. Further results of his excavations in the Nile valley were *Abidos* (1869-80), *Karnak* (1875). In 1878 he became a member of the Institut, and he died at Cairo in 1881.

Marigold, the popular name of several plants with golden blossoms, especially *Calendula officinalis*, the garden marigold, *Chrysanthemum segetum*, the corn marigold; the various species of *Tagetes*: the so-called French and African marigolds; and



MARIGOLD (*Calendula officinalis*).

Caltha palustris, the so-called marsh marigold. All these, except the last, which is ranunculaceous, belong to the order Compositæ (q.v.). The *Calendula* is a native of south Europe, and the *Tagetes* of Mexico and Peru. The corn-marigold is a common weed in our corn-fields, and the marsh-marigold grows in bogs and by the side of ditches. The *Calendula* was the *goldes* of Chaucer, the *heliotrope* of some old writers, "the marigold that goes to bed with the sun, and with him rises weeping" of Shakespeare's *Winter's Tale*.

Marine Corps, ROYAL, a military force under the Lords Commissioners of the Admiralty, available for service either on sea or on land. The Marines were, in the 17th century, ordinary land soldiers detailed for service on board ship; but long before the close of that century they began to be specially raised, and they were then known as the Lord High Admiral's Maritime Regiment of Foot, or, briefly, as the Admiral's Regiment. In 1684 the corps included twelve companies. After 1684 several other maritime regiments, such as those of Colonel Colt, Sir Cloudesley Shovel, and Lord Torrington, were raised and again disbanded; and it was not

until the dawn of the 18th century that this most valuable force, the proud motto of which is "*Per Mare, Per Terram*," began to assume the character which has ever since been associated with it. The corps is now divided into artillery (blue uniform) and light infantry (red uniform), and the headquarters of the former are at Portsmouth, while those of the three divisions of the latter are at Chatham, Plymouth, and Portsmouth respectively.

Marine Engines, engines used in steamers which make sea voyages.

Marine Glue, a solution of one part india-rubber, gently heated in mineral naphtha or coal-tar twelve parts, with the addition of powdered shellac twenty parts. Having been made, it is poured upon a slab to cool, and when needed for use is heated to about 250° Fahr. It is very adhesive, and unaffected by moisture. Another glue to resist moisture is composed of ordinary glue 1 lb. melted in skimmed milk two quarts, or of ordinary glue mixed with common chalk. A glue cement to resist moisture is made of glue 1 lb., black resin 1 lb., red ochre $\frac{1}{4}$ lb., mixed with the least quantity of water.

Mario, GIUSEPPE, MARCHESE DI CANDIA (1808-83), the great tenor, was, according to Engel, born at Cagliari. After serving for some time in the army of Piedmont, he came to Paris, where in November, 1833, he made his first appearance as a singer in *Robert le Diable*. His fine voice and pleasing manners soon made him highly popular in Paris, London (where he made his *début* in 1839), and St. Petersburg. He sang chiefly in the operas of Donizetti, Rossini, Meyerbeer, and Verdi. In 1846, under the conductorship of Costa, he and Grisi formed the centre of the new Royal Italian Opera in London, where he made his last appearance in July, 1871. He lost a large fortune by unfortunate speculations. He formed a connection with Giulia Grisi, by whom he had several daughters.

Marionettes, puppets moved by strings, which on a small stage imitate the actions of theatrical performers. Such puppets were exhibited in England in the latter half of the 17th century, and the "marionette theatre" is one of the most popular amusements in Italy.

Mariotte, EDMÉ, a French physicist of the 17th century, was born in Burgundy, where he was prior of St. Martin-sous-Beaune. He was one of the earliest members of the Académie des Sciences, and died at Paris in 1684. His most important work is *Essais de Physique*, containing the statement of the law of the pressure and volume of gases, which was called "Mariotte's law," though discovered by Boyle. Collections of his works were published at Leyden in 1717, and at the Hague in 1740.

Marius, CAIUS (155-86 B.C.), a great Roman general, was born at Arpinum. He entered the army as a common soldier, and rose to be an officer in Spain under Scipio Africanus the Younger. His marriage with Julia, the aunt of Julius Cæsar, assisted his advancement, and in 115 B.C. he became prætor. As second in command under Quintus Metellus he distinguished himself in the Jugurthine

War, and in 107 was elected consul and entrusted with the conclusion of the war, which he successfully accomplished. Marius was now employed to repel the incursions of the Cimbri and Teutones, and for this purpose was made consul in 104 and the three successive years. During this time he seems to have completely reorganised the Roman army. [LEGION.] The Teutones were overthrown with great slaughter in a terrible two days' battle near Aquæ Sextiæ (Aix) in 102 B.C., and the Cimbri were routed at Verecellæ, between Turin and Milan, in the following year. The remainder of the life of the great general was passed in a bitter struggle for political power with Sulla, the representative of the aristocratic party. Marius was made consul for the sixth time in 100, but was worsted by his rival in the contest for the command against Mithradates, and in 88 had to flee from Rome. The story of his attempted assassination in the marshes near Minturnæ (the modern Garigliano) is well known. He succeeded at length in escaping to Africa; and, a revolution in Rome having given his party the ascendancy, he returned to be elected consul a seventh time (86 B.C.), and to wreak vengeance on his opponents by a terrible proscription. He died seventeen days later.

Marivaux, PIERRE CARLET DE CHAMBLAIN DE (1688-1763), an ingenious French writer, the son of a financier, was born at Paris. Between 1713 and 1715 he wrote novels, but he first attracted attention by his burlesques of Homer and of Fénelon. He then produced at the Italian theatre a good number of clever plays, the best of which were *Le Jeu de l'Amour et du Hasard* (1730), and *Les Fausses Confidences* (1737). He also wrote a great deal for periodicals, and in 1731 began his chief work, the novel *Marianne*. His literary affectations gave the name of "Marivaudage" to writings of a similar style.

Marjoram, the English name of several species of *Origanum*, a genus of herbs and undershrubs belonging to the order Labiata (q.v.). They have bracts as long as the calyx and of the same colour, from 10 to 13 ribs in the tubular calyx, and an almost polysymmetric corolla. Wild Marjoram (*O. vulgare*) is common on limestone, growing a foot or two in height with massed pinkish flowers with deep crimson bracts and calices, and a somewhat stiffly dichotomous branching. It yields an acrid stimulant oil, known as *oil of thyme*, used in farriery and dentistry. *O. Marjorana* and *O. Onites*, natives of southern Europe, are old-fashioned pot-herbs.

Mark, the traditional author of the 2nd Gospel. The name occurs in the Acts of the Apostles (xii. 12) as "John, whose surname was Mark," to whose mother's house Peter went when released from prison. John Mark accompanied Paul and Barnabas on their first missionary journey, but left them at Perga, and returned to Jerusalem (Acts xii. 25; xiii. 13). Mark afterwards sailed with Barnabas to Cyprus (*ib.* xv. 38). St. Paul appears to have been afterwards reconciled to him, according to passages in Colossians, Philemon, and second Epistle to Timothy. In 1 Peter v. 13 "Mark, my son," is

spoken of; this has been taken literally by some, metaphorically by other authorities. Whether the Pauline, the Petrine, and the Synoptic author were identical has been much disputed. [GOSPELS.]

Mark, GOSPEL OF ST., the second of the Canonical and Synoptical Gospels of the New Testament, attributed by the Fathers to John surnamed Mark, a friend and follower of St. Peter. This Gospel was composed probably at Rome after 63 A.D. There is internal evidence that it was addressed to Gentiles, and was influenced by the testimony and teaching of St. Peter. The "received text" is mainly based on the edition of Erasmus (1516). The narrative of St. Mark is in many points more vivid and minute than those of the other Gospels.

Mark Antony. [ANTONY.]

Marl, an earthy rock containing lime mixed with clay or sand or both. One of the commonest forms of it is the *shell-marl* of fresh-water lakes, which consists of the remains of mollusks, entomostracans, and algæ, and is generally white. It accumulates in lakes, where there is little mechanical sediment, or if any then in times of flood, producing interlamination of marl and clays. Such deposits occur under the peat on the sites of former shallow lakes in Ireland and Scotland. Fresh-water limestones and clays of similar origin occur on a larger scale in the Eocene rocks of Wyoming, and in the Miocene of Switzerland and Auvergne. The shell sand of the Crag is practically a marine marl. As marl is a very valuable substance to add to stiff clay land, both because it lightens the soil and because it furnishes it with lime, the term *marling* is sometimes extended by farmers to the addition of merely sandy soil, and such loam (q.v.) is miscalled marl.

Marlborough. 1. An old town in Wiltshire, stands on the left bank of the Kennet, 10 miles S. of Swindon. To the south-west of the town is a British mound, on which a castle was built by William I. Here was held the Parliament of 1267, at which the Statutes of Marleberge were enacted after the Barons' War. The castle was for long after a royal residence, was taken in the Great Rebellion, and nearly burnt down in 1653. In 1843 the mansion erected near its site in the reign of Charles II. was converted into Marlborough College. Marlborough had long been a municipal borough when, in 1885, it was disfranchised.

2. A district in New Zealand, in the north-east of the South Island, the area of which is 3,000,000 acres. A great part is under pasture; and gold, copper, and other minerals are found.

Marlborough, JOHN CHURCHILL, DUKE OF, eldest son of Sir Winston Churchill, was born in 1650. He became a page to James, Duke of York, being introduced to his notice by his sister Arabella, who was the duke's mistress. Entering the army at an early age, Churchill served under Monmouth in Scotland, and with the French against Holland. Turenne was his master in the art of war. In 1678, when he married, he became colonel of the Life Guards, and, on the accession of his patron to the throne, was made a peer. He served James

skilfully in the Monmouth rebellion, but deserted him at the Revolution. Though he had been in favour of a regency, William III. recognised his abilities by making him a Privy Councillor and an earl, and by employing him in a military capacity in Ireland and Flanders. No sooner, however, was James back in France than Marlborough began to intrigue with him, and received a pardon from him for past offences. His real object, the setting up of Anne against both James and William, appears to have been divined by the Jacobites. When it was discovered by William in 1692, Marlborough was dismissed. He now joined the Tories, or anti-Dutch party, at the same time continuing his Jacobite intrigues. In 1696 he was implicated in Sir John Fenwick's plot, but generously forgiven by the king. Towards the end of the reign he regained William's confidence, and was not only made commander-in-chief, but also entrusted with important foreign negotiations. On the accession of Anne, Marlborough became all powerful. He induced the Tories to consent to the war with France, and himself assumed the command of the English and Dutch forces. In the ensuing war he was victorious at Blenheim, Ramilies, and Oudenarde over the best generals of Louis XIV., and was rewarded with a dukedom and the grant of a palace and estate near Woodstock, named after his greatest victory. Marlborough's position in England was never, however, completely secure. He was averse to party government, and tried to make himself an independent position by securing the governorship of the Netherlands from the Archduke Charles and the captain-generalship for life in England. The latter was refused like the former; for it came at a time when Anne was getting tired of the Whigs and of the arrogance of the Duchess of Marlborough. At the end of 1710 the duke was charged with receiving commissions on the supply of bread to the troops and on subsidies to the allies, and was dismissed. His career was over, and he retired to the Continent, where he corresponded both with the Jacobins and the Elector of Hanover. The result was that when he returned on the death of Anne, although he was made commander-in-chief, he was never again trusted with political power. He died at Blenheim Palace in 1722, having for some years nearly lost his faculties. His wife, Sarah, Duchess of Marlborough (the "Atossa" of Pope), to whom he was much attached, and who served him greatly with Anne till displaced in 1710 by Mrs. Masham, died in 1744 in her eighty-fifth year.

Marlitt, EUGENIE, *nom de plume* of E. JOHN, a German novelist. She was born in 1825 at Arnstadt, Thuringia, and entered upon a theatrical career, which she was obliged to abandon through illness. She afterwards acted as amanuensis to the Princess of Schwarzburg-Sonderhausen, her early patron. In 1863 she began to write romances, among the best of which were *Goldelse* (1866), *The Old Maid's Secret* (1867), and *Countess Gisela* (1869). She died in 1887.

Marlowe, CHRISTOPHER (1564-93), is supposed to have been the son of a Canterbury shoemaker.

After leaving the King's School there, he went to Corpus Christi (then Benet College), Cambridge, and took his degrees in Arts. We know little of his life before he began writing. It is certain that he was killed in a tavern brawl at Deptford in May, 1593. Marlowe was great both as a dramatic and a lyric poet. His *Tamburlaine the Great*, printed in 1590, but acted probably some years earlier, is memorable chiefly as the first example of blank verse worthy of the name. The *Tragical History of Doctor Faustus*, on the other hand, the first edition of which is of the date 1604, has both dramatic power and contains passages of intense lyrical beauty. The *Jew of Malta* is strong in the first two acts, but thenceforth degenerates. *Edward II.*, produced about 1590, is Marlowe's most finished work. Marlowe had a great share in some plays popularly ascribed to Shakespeare, such as *King Henry VI.* and *Titus Andronicus*. Marlowe's unfinished lyric, *Hero and Leander* (1598), is one of the most beautiful in the language. Chapman was entrusted by the author with its completion. The pastoral poem, *Come Live with me, and be my Love*, which is generally printed in volumes containing Shakespeare's sonnets and lyrics, is also most probably Marlowe's.

Marmalade, originally a confection of quinces (Portuguese, *marmelo* = "quince"), a preserve of fruit boiled with sugar, now mostly confined to a pulpy preserve of oranges or lemons or quinces.

Marmion, SHAKERLEY (1602-39), an English dramatist, was born in Northamptonshire. After leaving Oxford, he ran through his fortune and served as a soldier in the Netherlands. He died at London, whither he was obliged to return when on his way to serve in the expedition against the Scots. He was author of *Holland's Leagues* and two other comedies, and an epic, *Cupid and Psyche*.

Marmont, AUGUSTE FRÉDÉRIC VIESSE DE, DUC DE RAGUSA (1774-1852), the last to survive of Napoleon's marshals, was a native of Châtillon-sur-Seine. Having entered the army just before the Revolution, he was an artillery officer when he met Bonaparte at Toulon. In the Italian campaign of 1796 he acted as his aide-de-camp, and in Egypt two years later he was a general of brigade. For his services on the day of 18 Brumaire he was made a Councillor of State, and, as commander-in-chief of the artillery reserve, directed the crossing of the Great St. Bernard and was present at Marengo. He was named Duc de Ragusa in 1808 for his able administration of Dalmatia, and Maréchal de France after Wagram in 1809. In 1811 he was transferred from Illyria to the command in Portugal, but was defeated by Wellington at Salamanca in the next year. In the campaign of 1813 he defended the approaches to Paris with great ability; but, on account of his want of success, he was excepted from the amnesty proclaimed by Napoleon to those marshals who had accepted the Bourbons at the first restoration. In 1830 he emerged from retirement in order to take command of the royal troops, and after the Revolution was dismissed and retired to Venice.

Marmontel, JEAN FRANÇOIS (1723-99), a French writer and encyclopædist, was born in Limousin and educated by the Jesuits of Manriac. In 1745, on the advice of Voltaire, he came to Paris, and in the succeeding years produced several tragedies. He also contributed to the *Encyclopédie* a series of articles which were republished as *Éléments de Littérature*, on which and his *Contes Moraux* (1761) his reputation rests. His *Bélisaire*, an epic romance, was chiefly remarkable for a chapter which was censured by the Sorbonne for its advocacy of religious toleration. In 1783 he was appointed secretary to the Académie and historiographer of France. Marmontel was ruined at the Revolution, and died in a village near Evrenx.

Marmora, SEA OF. [BLACK SEA.]

Marmoset, any individual of the South American family Hapalidæ, the smallest known monkeys, some being only a few inches long. They are also called Squirrel Monkeys from their form, and Ouistitis from their whistling cry. They make affectionate pets, but are very sensitive to cold and need great attention. They have bred in captivity in England.

Marmot, any individual of the genus *Arctomys* of the Squirrel family, with about a dozen species



MARMOT (*Arctomys marmotta*).

from North America, the mountains of Central Europe, and Central Asia. They are stontly built, with short ears and tail, live in burrows, often gregariously, feed on roots and leaves, and hibernate. *A. marmotta*, the Common or Alpine Marmot, is about the size of a rabbit, with brownish-red fur above, lighter beneath. The American species are called groundhogs or woodchucks. [PRAIRIE DOG.]

Marne, a river of France which gives its name to two departments. Rising in the hilly country north of Langres, it flows in a north-westerly direction for some 300 miles till it joins the Seine at Charenton. It is navigable as far as St. Dizier, and is connected by canals with the Rhine and the Aisne, as well as with the Seine. The department of Marne has an area of 3,159 square miles, and has Aisne and Ardennes on the north, Anbe on the south, Seine-et-Marne on the west, and Meuse on the east. From the vines grown in the north the best champagne is made; in other parts of the department there is excellent pasturage, and good root crops are raised. Châlons and Rheims are the chief towns. Haute-Marne lies to the south-east

between Aube, Vosges, Meuse and Côte d'Or. It has an area of 2,402 square miles. Large quantities of iron ore are obtained from the soil, and much wine is made. Chaumont is the chief town.

Marnix, PHILIP VAN, COMTE DE ST. ALDEGONDE (1538-98), a famous Dutch patriot and writer, was born at Brussels and educated at Geneva. On his return to the Netherlands he put his Calvinistic principles into practice. He took an active part in the revolt against Spain, and in 1572 represented his friend William of Orange at the meeting of the Estates at Dort. He made great efforts as a diplomatist to obtain help from Elizabeth and from France, and to him was owing in great measure the formation of the Union of Utrecht. In 1583-84 he for more than a year defended Antwerp against the Spaniards, but his ultimate capitulation made him so unpopular that he spent the rest of his days in literary retirement, dying at Leyden in 1598.

Maronites, a Syrian people occupying the western slopes of Mount Lebanon and neighbouring coastlands, traditionally descended or named from a patriarch Maronius, and formerly monothelites, but in 1215 united to Rome, though retaining some peculiar national rites and privileges, such as celebrating the *Latin* mass in the *Syrian* language. At present, however, all speak Arabic exclusively. Population, about 230,000. For their long wars with their pagan Druze neighbours see DRUZES.

Marot, CLÉMENT (1496?-1544), one of the best of French early poets, was born at Cahors some time in the winter of 1496-97. He and his father found patrons in Francis I. and his sister, Marguerite, afterwards Queen of Navarre, who pensioned Clément; to her he dedicated his poems. He went with Francis to Italy in 1524, and was wounded at Pavia. Soon after his return he was imprisoned for heresy. He was rescued from prison by Marguerite on this occasion, and again in 1531, but in 1535 was advised to leave France. He took refuge at Ferrara, and from thence went to Venice, but was allowed to return to France in 1539. He then published a translation of the Psalms, which, though highly popular, was condemned by the Sorbonne. The unorthodox views and satirical tongue of Marot combined to make him enemies, and in 1543 he was obliged to leave Paris for Geneva. Calvin's austerity was too much for him, and he next went to Piedmont, and died at Turin.

Marozia, a Roman lady of noble birth but scandalous reputation, was the daughter of the notorious Theodora. She was a great power in Italy in the 10th century owing to her connection with Pope Sergius III. She procured the deposition of John X., and the election of her own son as John XI., as well as the succession of her grandsons, John XII. and Leo VII. She died in prison in 938.

Marquesas, or MENDANA ISLANDS, THE, are situated in the South Pacific between lat. 8° and 11° S. and long. 138° and 141° W. They consist of the five islands discovered by Mendaña in 1595, and seven others discovered by an American named

Ingraham in 1797. Nuka Hiva and Hiwaoa are the names of the largest. The inhabitants, who have largely decreased in numbers, are fine specimens of the North Polynesian race. In 1842 these islands were placed under the protectorate of France.

Marquis, MARQUESS, a title of nobility, originally a governor of a frontier or march, now a nobleman next in rank below a duke (whose eldest sons generally bear the title by courtesy), and above an earl or count. The first titular marquis in England was created in 1387—namely, Robert de Vere, Earl of Oxford, Marquis of Dublin.

Marriage among civilised peoples is the legal union of a man and a woman in the relation of husband and wife. By anthropologists the term is used in a much wider sense, and denotes any union of the sexes sanctioned by the community, and founded on the contract which is of the essence of marriage, as we understand the term, though authorities are not agreed as to the last condition. The union may be lasting or temporary, there may be a plurality of husbands to one wife, or a plurality of wives to one husband; but if it becomes a "recognised right, protected by the tribe," it is entitled to the name of marriage. Whatever may have been the sexual relations of primitive man, there can be no doubt that, from the modern standpoint, they were very lax. Some authorities believe that the condition of affairs is best described as "promiscuity," which is sometimes dignified with the title "communal marriage," in which, according to Sir John Lubbock, "all the men and women in a small community were regarded as equally married to one another." But since no individual could appropriate what belonged to the community, it follows that no man could have a wife to himself. Against this state of affairs Bachofen considers the women rose in revolt, and introduced monogamy "not without an appeal to force." A more probable view is that it was "gradually superseded by individual marriage, founded on capture," of which custom two well-known examples are the Rape of the Sabines and the carrying off of the daughters of Shiloh by the sons of Benjamin (Judges xx. xxi.). As civilisation increased other methods of procuring wives were adopted, but customs which were doubtless survivals of the practice long lingered even in Europe; and Darwin suggested that the "best man" was originally the chief abettor of the bridegroom in the act of capture. With marriage by capture was closely related the practice of exogamy, or the interdiction of marriage between persons of the same totem-clan. But the nature of the relation is by no means clear. Primitive man must have formed sexual connections with his own kindred, and the practice of infanticide (q.v.) must have limited the number of women, and so led to the practice of capturing women from another group for wives. This custom, long continued, would tend to acquire the force of law, till what was begun from necessity would be continued after the necessity had ceased to exist. Exogamy has been very prevalent, and is still the rule among some of the American Indians, the aborigines of Australia,

the Brahmans, and the Chinese. Amongst ourselves it is limited to blood relationships, and finds expression in the Table of Prohibited Degrees. Endogamy—which forbids marriage except between those akin, that is, between those of the same group—has also had a wide range. It may have arisen from tribal jealousy—a despising of “the daughters of Heth.” Sir John Lubbock suggests that the difference between endogamous and exogamous tribes arose from the proportion of the sexes, and that where male children were in excess exogamy would prevail, and that where girls were in excess endogamy would be practised. [FAMILY.]

The law of marriage is founded partly on Statute and partly on Common Law. In George II.’s reign it was enacted that the publication of banns and the solemnisation in one of the churches where they had been published was required, and that two witnesses besides the minister should be present, and that the register should be signed by the minister, parties, and witnesses. The statute as to the formalities of the marriage was strictly confined to England, from which circumstance what were known as Gretna Green marriages were valid. A later statute and other subsequent statutes provide for the validity of marriages celebrated in churches and chapels without the publication of banns [BANNS]; and by other statutes, marriages by or without licenses may be solemnised by virtue of the superintendent registrar’s certificate. By the Common Law of England the requisites to the validity of marriage are:—

1. The presence of a priest in holy orders.
2. The presence of witnesses.
3. The consent of the parties.
4. The formalities of marriage as defined by the *lex loci actus* must be observed.
5. The essentials of the marriage as defined by the *lex domicilii*, including therein all questions of personal capacity or incapacity, must be observed.
6. The parties must not be within the prohibited degrees of consanguinity or of affinity, and for this purpose illegitimate relationship counts, but the consent of parents is not necessary.

As regards Scotland the marriage law is different, the consent of parties alone being sufficient to constitute the contract, and children born out of wedlock in that country, as in most others, become legitimate by the subsequent marriage of the parents, whereas in England the marriage ceremony must precede the births of children to render them legitimate. In the United States, as a general rule, no particular form is necessary to constitute a valid marriage if the consent of the spouses is proved. In some states the marriage must be authorised by a grant of license, and in Pennsylvania 12 witnesses are necessary; and the prohibition which exists here against marriage with a deceased wife’s sister is very nearly unknown.

Marryat, FREDERICK, CAPTAIN (1792–1848), sailor and novelist, was the second son of Joseph Marryat, M.P., agent for Grenada. He several times ran away from school in order to go to sea, and at the age of fourteen was allowed to enter the navy. He was for more than two years a midshipman in Lord Cochrane’s ship, the *Impérieuse*, which cruised in the Mediterranean during the French war. He greatly distinguished himself in

action, and soon after the peace attained the rank of commander. He was afterwards employed in the Burmese War of 1824–25, and had in 1819 been elected F.R.S. His first novel, *Frank Mildmay*, was written on board ship; but a year later, in 1830, he relinquished active service and settled at Hammer-smith. From 1832 to 1836 he edited the *Metropolitan Magazine*, in which appeared *Peter Simple*, *Japhet in Search of a Father*, *Jacob Faithful*, and others of his novels. The best of these were *Mr. Midshipman Easy* (1834) and *Snarley Yow: or, the Dog Fiend* (1837). After the publication of the latter he was in America for two years, the result of his visit being *The Phantom Ship* and *Diary in America*. In 1847 the news of the loss of his eldest son on the *Avenger* hastened his death, which occurred the following year.

Mars, one of the planets in the solar system, has its orbit outside that of the Earth, and is therefore one of the so-called superior planets. At its nearest position Mars is 48,000,000 miles from the Earth, no other planet except Venus approaching us more nearly. Its diameter is about 5,000 miles; so its surface is only two-fifths as extensive as the Earth’s. Its density is much less—about three-quarters that of the Earth; so a pound weight placed on its surface would not weigh much more than six ounces, and a ponderous elephant would, if there, be able to jump about with the agility of a fawn. Mars travels in an orbit whose centre is 130,000,000 miles away from the sun; when nearest to the sun, it is 126,000,000 miles away. When farthest from it, the distance is 152,000,000 miles, the average distance being about 139,000,000 miles. The heat and light which Mars receives from the sun, therefore, vary enormously, and so cause a difference in the lengths of winter and summer in his N. and S. hemispheres, the seasons in the N. hemisphere being far more temperate than those in the S. The Martian year is about 687 of our days, and its day 40 minutes longer than ours. Viewed with the telescope, large dark green spots are seen, the rest of the surface being of a ruddy tint, except at the two poles, where two white spots are observed and considered to be due to large masses of snow and ice. It has been supposed that the greenish spots are oceans, and the ruddy parts land. The spectroscope has shown that watery vapour is present in Mars’ atmosphere, and appearances like huge rain-clouds sometimes obscure a part of the planet for a considerable period. Physical processes seem to go on there much the same as on our planet; hence many believe that Mars is inhabited and forms, in fact, a miniature picture of the Earth.

Mars, or MAVORS, was the Italian god of war, corresponding to the Ares of the Greeks. As the traditional father of Romulus (q.v.), he was also regarded as a specially Roman god, and was styled Marspiter (“Father Mars”). By the Romans he was also called Quirinus, the god of the Quirites, or citizens. The field where the Roman youth trained themselves in arms and athletic exercises was known as the Campus Martius; the first month of the year bore the name of the god; and the

annual games were called *Ludi Martiales*. Temples of Mars were numerous at Rome; his priests, called the Salii, were clad in armour. The wolf and woodpecker were sacred to him.

Mars, ANNE FRANÇOISE (1779–1847), a great French actress, was the natural daughter of an actor named Monvel and an actress named Mars. She made her *début* in 1792, and seven years later became a *sociétaire* of the Comédie Française. She played with great success in Molière and Marivaux,

Marseilles (French *Marseille*), the third town of France and its chief port, is the capital of the department of Bouches du Rhone. A colony was founded here and called Massalia by the Phocæan Greeks in the 7th century B.C., and soon became an important trading centre, which founded colonies of its own on all the shores of the Mediterranean. In return for its assistance against Carthage the Romans left it as a *civitas fœderata*, or nominal ally but not subject of Rome. In 1112 the town became a free republic, and during



MARSEILLES : THE DOCKS.

as well as in Scribe and Delavigne; and “created” Dona Sol in *Hernani* and the *title-rôle* in Dumas’s *Madame de Belleisle*. She took leave of the stage in 1841, and died at Paris six years later.

Marsala, a seaport at the westernmost point of the heel of Sicily, stands on the site of the ancient Lilybæum. It was for two centuries in the hands of the Saracens, who were driven out by the Normans in the 11th century. Here Garibaldi landed in 1860. The harbour, which had been disused for nearly three centuries, was reconstructed in the 19th century; it is defended by a citadel. The trade in Marsala wine, now large, dates only from 1802, when it was supplied to the British fleet.

Marseillaise, THE, so called because introduced into Paris by patriots from Marseilles, is the national anthem of the French republic, composed at Strasburg in April, 1792, by Rouget de Lisle, an officer of engineers, as the war song of the army of the Rhine.

the Crusades it regained its early importance. It played an important part during the French religious wars and during the French Revolution. It lost its ancient liberties when taken in 1660 by Louis XIV. In 1871 it continued its revolutionary traditions by proclaiming the Commune. Marseilles is almost equally important as a commercial and a manufacturing city. More than 8,000 vessels enter its harbour every year, and it is the headquarters of the Messageries Maritimes and several other great trading companies. The old harbour has an area of nearly 70 acres; and, besides this, there are numerous new docks and quays farther west covering even a greater surface, and an outer roadstead. Great quantities of soap and oil-cake are made, and there are important leather manufactories, large flour-mills, and extensive wine-vaults. Other important industries are metal-working and sugar-refining. The chief imports are cereals and silk. The most interesting buildings in Marseilles are the church of Notre Dame de la Garde, built in 1864, on the site of a 13th-century building, and containing

an image of the Virgin, the special protection of sailors; that of St. Victor, built in 1200, having 11th-century catacombs; and the Longchamps palace, a fine modern building.

Marsh, GEORGE PERKINS (1801-82), American philologist, author of *The Origin and History of the English Language* (1862) and some miscellaneous works, including *The Camel: His Organisation, Habits, and Uses* (1856). He was born at Woodstock, Vermont, and graduated in 1820 at Dartmouth College, New Hampshire. Having already been a member of the Executive Council of Vermont, he sat in Congress from 1842 to 1849, when he was appointed United States minister at Constantinople. In 1852 he went on a special mission to Greece, and was appointed ambassador to Italy in 1861. He died at Vallombrosa.

Marshal, originally a king's or great noble's "horse-servant," i.e. groom or farrier, an official whose duties came to include those of master of the ceremonies and chief usher. He is now represented in England by the hereditary Earl Marshal. In military establishments a marshal or field-marshal is a field-officer of the highest rank, to whom only a commander-in-chief is superior. The term is applied to officials of various kinds, e.g. the executive and administrative officer of a judicial district in the United States.

Marshall, JOHN (1755-1835), a great American lawyer, was a native of Fauquier county, Virginia. After serving under his father in the American war, he, in 1781, began to practise as a lawyer. He soon became head of the Virginian bar, and was several times elected to the Legislature of the state. In 1788 he assisted Madison to obtain the acceptance of the Federal Constitution; and in 1797 went to France as one of the special envoys of the United States. Soon after his return he was elected to Congress, and in 1800 became Secretary of State, but resigned in the next year in order to take the office of Chief Justice of the United States. His decisions as such have always been regarded as of the first importance; a selection of them appeared at Boston in 1839.

Marshall Islands, an archipelago in the West Pacific, situated to the east of the Caroline Islands, consist of two groups of coral reefs, called respectively the Ratak and the Ralik chains. The whole thirty islands have an area of about 107 square miles. They were annexed by Germany in 1885. Cocoa-nut palms and bread-fruit trees abound, and copra is exported. The inhabitants are skilful weavers.

Marsh Gas. [METHANE.]

Marsh's Test for arsenic is one very commonly adopted for the examination of liquors, etc., suspected to contain arsenic. The liquor is added to a flask, from which hydrogen is evolved by the action of sulphuric acid and zinc. Arseniuretted hydrogen is so formed, and passes through combustion tubing heated by three or four bunsen burners, when it decomposes and arsenic becomes deposited as a brown stain in the cool portions of

the tube. It is, of course, necessary to take great care to ensure the complete absence of arsenic in all the reagents employed.

Marston, JOHN, a satirist and playwright of the Shakespearean age, was born in Shropshire about 1575, and educated at Brasenose College, Oxford. In 1598 he wrote a satire called *The Scourge of Villanie*, and in the same year *Pygmalion's Image*, which he put forward as a parody of poems like *Venus and Adonis*. He was himself ridiculed by Ben Jonson in *The Poetaster* and other works, but afterwards collaborated with him and Chapman in a play called *Eastward Ho!* for certain political allusions in which the authors were imprisoned. Marston's own best plays were *The Malcontent* (1604), *The Dutch Courtesan* (1605), and the horrible tragedy of *Sophonisba* (1606). Marston appears to have taken orders some year between 1607 and 1616. He died in London in 1634.

Marston, JOHN WESTLAND (1820-90), a dramatist of the school of Knowles and Bulwer, was a native of Boston, Lincolnshire. He was articled to his uncle, a London solicitor, in 1834, but soon devoted himself to literature. His most popular play was his first, *The Patrician's Daughter*, produced by Macready at Drury Lane in 1841. Mr. Charles Kean appeared in his *Strathmore* and other plays, Helen Faucit in *Madame de Meranie* (1856), and Miss Neilson in *Life for Life* (1868). He also wrote lyrics of some merit, and *Our Recent Actors* (1888).

Marston, PHILIP BOURKE (1850-87), son of the foregoing, when quite young became blind, and to this misfortune was added the sorrow caused by the death of his betrothed. These things gave his poetry a mournful tone. *Song Tide* (1870), *All in All* (1875), and *Wind Voices*, are the titles given to his volumes of poems. Philip Marston was the friend of Rossetti and Mr. Swinburne, who had a high estimate of his powers.

Marston Moor, the scene of one of the great battles of the Civil War, which took place July 2, 1644, is 7 miles N.W. of the city of York. The two armies were about equal in numbers, the Royalists being commanded by Prince Rupert, and the Parliamentarians by Fairfax, Manchester, and Leslie, Earl of Leven, who headed a Scots contingent. The king's cavalry at first carried all before them, but the day was retrieved by Cromwell's Ironsides. The Cavaliers lost 4,000 men, and never recovered their prestige.

Marsupials (*Marsupialia*, the *Didelphia* of De Blainville, and the *Metatheria* of Huxley), a sub-class of mammals in which there is no organic connection between the mother and the young during the short intra-uterine life of the latter, which are born in a very imperfect condition, and carried for some time in the abdominal pouch (*marsupium*), whence the sub-class derives one of its names, and there suckled from the enclosed teats. There are six families, forming two groups.

I. POLYPROLODONT (of more or less carnivorous habits, with numerous small incisors and large canines):—

- Fam. 1. Didelphyidæ. [OPOSSUM.]
- „ 2. Dasyuridæ. [DASYURE, THYLACINE.]
- „ 3. Peramelidæ. [BANDICOOT.]

II. DIPROTODONT (with the central incisors prominent, and the lateral incisors and canines small or absent):—

- Fam. 4. Phascolomydæ. [WOMBAT.]
- „ 5. Phalangeridæ. [PHALANGER.]
- „ 6. Macropodidæ. [KANGAROO.]

With the exception of the first family, which is American, the sub-class is confined to the Australian region.

Marten, any individual of the genus *Mustela*, of the Arctoid family Mustelidæ, with seven species from the northern parts of both hemispheres. They resemble weasels in form, but are of larger size, with bushy tail, arboreal in habit, and feed on birds and eggs, small mammals, reptiles, and amphibians. The fur is of commercial value. [SABLE.] The largest species, the Pekan (*M. pennanti*), from North America, with blackish fur, may have a total length of about four feet. It is sometimes called the Fisher Marten, but probably without foundation. The only British species, the Pine Marten (*M. martes*), has rich brown fur. The European Beech or Stone Marten (*M. foina*), supposed by Rolleston to have been the “cat” of classic times, has greyish brown fur, and a white throat. An Indian species (*M. cathia*) is domesticated, and is used to drive away rats and mice.

Martial (MARCUS VALERIUS MARTIALIS), the Latin epigrammatic poet, was born about the year 40 at Bilbilis in Spain, near the source of the Tagus. His parents' names were Fronto and Flaccilla. He came to Rome at an early age, and stayed there till the year 91, living on the patronage of Calpurnius Piso, the Senecas, Titus, and Domitian, whose favour he returned by fulsome eulogies. Although he had a small estate at Nomentum, he was always needy, and at times quite without resources. He seemed to prefer this to practising as an advocate, as his friend Quintilian had advised him. When he revisited his native land he appears to have been protected by a cultured lady named Marcella. He died about 102 or 103. His earliest work, the *Liber Spectaculorum*, was composed at the end of the reign of Titus. The first nine books of the *Epigrams* appeared in the reign of Domitian; book xi. in 86, the year of Nerva's accession; and a revised edition of book i. in 98. The last book was written in Spain shortly before his death. For literary polish and shameless grossness of description, flattery, and abuse, Martial is unrivalled.

Martial Law, a series of regulations made to preserve order and discipline in the army, and enforced by the prompt decisions of courts martial; this is generally known as military law. During the existence of a rebellion, when, in consequence of the ordinary processes of law becoming ineffectual for the security of life and property in any province or state, the Legislature has appointed that a

military force shall be employed to suppress the disorders and secure the offenders; and when the trial of the latter takes place according to the practice of military courts, that province or state is said to be subject to martial law. On such an event occurring in any part of the British dominions, the two Houses of Parliament jointly with the Crown determine that a temporary suspension of the Habeas Corpus Act shall take place. This course is only adopted in cases of great emergency, and the necessity for it and the period of its duration are always set forth in the provisions of the Act. [HABEAS CORPUS.]

Martin. [SWALLOW.]

Martin, Bishop of Tours, was born about 320, and died about 400. He was a native of Pannonia, but was educated at Pavia. After serving in the Imperial army under Constantine and Julian, he returned to his native country for a time, but left it about 360 for Gaul. In 371 he was taken from his convent near Poitiers and made Bishop of Tours against his will. His fame as a worker of miracles, which are recorded in his life by Sulpicius Severus, drew crowds of visitors to see him. He died at the monastery of Marmoutiers, which he had himself founded. He was canonised, and his festival is celebrated on November 11, which is still known in Scotland as Martinmas, the beginning of winter. The story of his dividing his cloak with a beggar, frequently forms a subject for the painter.

Martin, BON LOUIS HENRI (1810-83), the great French historian, was born at St. Quentin and trained for a legal career. He soon, however, made up his mind to write, and began by publishing some historical romances, three of which deal with the Fronde period. He then contributed a short history of Germany, Switzerland, and the Netherlands to the *Bibliothèque Populaire*, and in 1833, in conjunction with Paul Lacroix, entered upon a compilation of French history from chronicles and histories. His great work, *The History of France*, from the earliest times to 1789, was begun in 1833 and finished in 1836. The third edition, which was largely extended, was finished in 1854, and received the Gobert Prize. The fourth, in seventeen volumes, was further improved, and published in 1860. It was awarded the prize of the Institute in 1869. The crown to his literary career was his election to the Académie Française in 1878. In politics Martin was a strong republican. He became a deputy in 1871, and a senator in 1876.

Martin, SIR GEORGE, was born in 1764, entered the navy in 1771, and shared in Rodney's three actions in 1780. He became a commander in 1782, and a captain in 1783. He took part in the battle of St. Vincent. In 1800 he took charge of the blockade of Malta, the capitulation of which he received. He died in 1847.

Martin, JOHN (1789-1854), a painter, very popular in his day, was born near Hexham, in Northumberland, and in 1806 came to London. Of his sixteen huge canvases, which were considered by some critics of the day superior to Turner,

Belshazzar's Feast and *The Ere of the Deluge* are best known.

Martin, SIR THEODORE, was born in 1816, the son of an Edinburgh solicitor. He adopted his father's profession and practised for some years in Edinburgh and London, and first became known as a writer by the publication of the *Bon Gaultier* ballads, some of which were written by Aytoun. In biography he produced lives of the Prince Consort and Lord Lyndhurst; and as a translator he distinguished himself by creditable versions of Horace's *Odes*, Catullus, Dante's *Vita Nuova*, of Danish poems, and, above all, of the works of Goethe and Heine. In 1851 he married Helen Faucit, the actress.

Martin, SIR THOMAS BYAM, was born in 1773, entered the navy in 1782, and was made a commander in 1793 and a captain in the same year. He assisted in the reduction of Bastia. He became a rear-admiral in 1811, and after much further service died Admiral of the Fleet in 1854.

Martineau, HARRIET (1802-76), an English miscellaneous writer, was the daughter of a manufacturer at Norwich. Her careful Unitarian education stood her in good stead when in 1829 she found herself obliged to earn her own living. Very early she became almost completely deaf, but she had already written articles and short stories, and in 1830 gained prizes for some theological essays; but it was in 1832, when her *Illustrations of Political Economy* began to be published, that she achieved a reputation. In 1834 she paid a two years' visit to America, and on her return wrote *Society in America* and other descriptive works. She now contributed largely to Charles Knight's popular publications, and also wrote children's stories. From 1838 to 1844 illness interrupted her labours, but in the latter year she published a book against game laws. In 1846 she went to Egypt and Palestine and wrote a work on Eastern life. Her most important works were *The History of the Thirty Years' Peace* (1815-45), with an introductory volume; *Letters on the Laws of Man's Nature and Development*; and an epitome of Comte's *Philosophie Positive*. She was afterwards connected with the *Daily News*, and she left an *Autobiography*.

Martineau, JAMES, one of the ablest of modern English thinkers, was born in 1805. Miss Martineau was his elder sister. He was educated at Norwich grammar school, and under Lant Carpenter at Bristol. Originally intended for an engineer, he soon became interested in philosophical and theological subjects, and entered the Unitarian ministry. From Liverpool he went to Manchester New College, Manchester, in 1840, as professor of Mental and Moral Philosophy, and in 1848-49 attended lectures on metaphysics in Germany. In 1857 he came to London as professor and Unitarian minister, and in 1869 became principal of Manchester New College. He retired from that position in 1885, having some time before ceased his ministerial work. His candidature for the Chair of Mental Science at University College,

London, was defeated (chiefly by George Grote) on the ground that he was a minister. Chief among his works are *Essays Philosophical and Theological* (1868), *Hours of Thought* (1876-80), *Types of Ethical Theory* (1885), *A Study of Spinoza* (1882), *The Seat of Authority in Religion* (1890).

Martinique (called *Martinico* by the Spaniards and *Madrena* by the natives), one of the West India islands, belongs to the Lesser Antilles. It is 43 miles long, and has an area of 380 square miles. Discovered in 1493 by the Spaniards, it was colonised by the French in the 17th century, and has ever since been held by them, except for short periods in the Seven Years' and Napoleonic wars, when it was captured by Great Britain. The island is mountainous in the north and south, and well-watered, but the climate is hot and unhealthy. Much sugar is cultivated and exported, and manioc, sweet potatoes, and bananas are grown. The work has been done by coolies since 1848. The principal towns, which are in the west, are Fort de France and St. Pierre, the former of which suffered a disastrous fire in 1890.

Martius, KARL FRIEDRICH VON (1794-1868), German traveller, was born at Erlangen. He was the author of some important works describing his travels in Brazil as a member of a scientific expedition in 1817-20, and on the people and plants of that country. He died at Munich, where he had been professor of botany for nearly forty years.

Martyn, HENRY (1781-1812), missionary, was the son of a Cornish miner. He was Senior Wrangler at Cambridge, and Smith's prizeman in 1801, and was for a time curate under Charles Simeon, but in 1805 sailed for India as a military chaplain. He died at Tokat, in Asia Minor, when on his way from Persia to Europe. His life had been a weary one, owing to disappointment in love and habitual ill-health. He translated the New Testament into Persian and Hindustani, and the Psalms also into Persian.

Martyr, one who bears witness (to his faith), especially a Christian who, in a time of persecution, suffered death rather than deny his faith. The term is loosely used in the sense of sufferer or victim.

Marvell, ANDREW (1621-78), satirist, pamphleteer, and poet, was the son of the rector of Winestead, in Yorkshire. He was educated at Hull and at Trinity College, Cambridge. He then spent several years in travelling on the Continent, and in 1650 became tutor to Lord Fairfax's daughter. For a year, in 1657, in spite of his monarchical views, he was Milton's assistant as secretary to Cromwell, and next year entered Parliament as member for Hull. From 1663 to 1665 he was absent from his duties owing to his holding a diplomatic post; but, with the exception of this period, he attended regularly in Parliament, and wrote reports of the debates for his constituents, which are, in the absence of official reports, of considerable historical value. They end only with his death in 1678. Marvell's satires and pamphlets exercised considerable influence on public opinion.

A reward was offered for the discovery of *The Growth of Popery and Arbitrary Power* (1677); and *The Rehearsal Transposed* and *Mr. Smirke on the Divine in Mode*, written against an Oxford clergyman, were effective defences of religious toleration. His poems, written before his entrance into public life, are, says Lamb, distinguished by a witty delicacy.

Marx, KARL (1818-83), the Socialist writer and agitator, was born at Trier, where his father held a post in the Civil Service. He studied law and philosophy at Bonn and Berlin, and became an adherent of the young Hegelian school. In 1842 he began to edit the *Rhenish Gazette*, a revolutionary organ, after the suppression of which he went to Paris, where he assisted to conduct the *Deutsche Französische Jahrbücher*. In that organ he published several important articles, one of which was on the Hegelian philosophy of law. In 1844 Guizot expelled him from France at the request of the Prussian Government. He now settled at Brussels, where he continued to attack the government of his native province and published his reply to Proudhon's *Philosophie de la Misère*. Here also, in 1847, he published his Communist Manifesto, a declaration of the principles of International Socialism, which was soon circulated throughout Europe. Expelled from Brussels, Marx went to Paris in 1848 at the request of the Provisional Government, but left it for Cologne a few months later, and established with Engels and others the *New Rhenish Gazette*. The paper was twice unsuccessfully prosecuted, but in June, 1849, was suppressed. The rest of his life Marx spent (often in the utmost poverty) in London, where he wrote for the *New York Tribune*, and published various pamphlets and the *Kritik der Politischen Economie* in 1857, his first economical work. In 1864 the International Working Men's Association was founded, and Marx appointed to draw up its rules and deliver the first inaugural address, but in 1872 it died. Not long after this he retired from active life and devoted his time to the completion of his great work *Das Kapital*, the first volume of which had been published in 1867. When he died, at Hampstead, he left the second and third volumes in MS. His daughter, Mrs. ELEANOR MARX AVELING, is a well-known English Socialist.

Mary, a feminine name derived from the Hebrew, and used so often in the New Testament as to lead to some confusion as to the different bearers of it. The most illustrious of these is the mother of Christ. Little is known of her parentage, though tradition has much to say on the point, and, as to her later life, the general idea is that after the crucifixion she was under the care of St. John the Divine. The belief in her perpetual virginity is first found in the *Proterangelion Jacobi*, which makes her to have been brought up in the Temple, and the idea became general in the 4th century, and received authoritative sanction at the Council of Chalcedon (451). The belief in her immaculate conception was the product of the 12th century, and the vindication of her title of Mother of God dates from as early as the 3rd and 4th centuries. Of the many festivals of the Virgin, some

are common to several Christian churches; the festival, however, of the Assumption finds no place in the Anglican Church.

Mary I. (1516-58), Queen of England, was the daughter of Henry VIII. and Catharine of Aragon (q.v.), and began her life under favourable auspices, and had Cardinal Wolsey as godfather. At the age of 10 she had a court of her own at Ludlow, and many arrangements were made from time to time as to her future marriage; but the divorce of Catharine and the ascendancy of Anne Boleyn wrought a great change in her circumstances. Declared illegitimate, she had to be content with a situation altogether subordinate to that of her younger sister, and, though the death of Anne Boleyn and its results brought some amelioration, she was still treated with considerable harshness by her father. Still at his death Henry had so much sense of justice as to provide for her in his will. Her chief advisers were Gardiner and the Emperor Charles V., and her marriage with Philip, son of the latter, was the principal cause of her later unpopularity, first as introducing the Spanish Inquisition into England, and secondly as being in itself displeasing to the English, who already felt distrust of the queen on account of her religion.

Mary II. OF ENGLAND (1662-94) was the daughter of James II., by Anne Hyde, his first wife, and having married William of Orange (afterwards William III. of England), reigned conjointly with him after the abdication of her father.

Mary Stuart (1542-87) was the daughter of James V. of Scotland and Mary of Lorraine, and succeeded as a baby to the throne of her father, who died at feud with his nobles. At the age of six the little princess was betrothed to the Dauphin of France, and went to Paris to be trained by Catharine de' Medici (q.v.). She was married in 1558, and three years after as Dowager Queen of France she returned to her Scottish kingdom, now become almost alien to her in religion and in tastes. Her controversies and struggles with John Knox and his congeners were ominous of what was to come. At the outset of her reign her half-brother, Murray, and Maitland were her friends, and, although the affair of Chastelard may have done her some damage, it was not till her ill-fated marriage with Darnley that the tide of misfortune really set in. The murder of Rizzio, followed by that of Darnley, as to which the question of Mary's guilt or innocence has always been matter of doubt, her mysterious relations with Bothwell, her imprisonment at Lochleven, her abdication in favour of Murray as Regent, her escape from Lochleven by aid of George and Willie Douglas, and the battle of Langside, which crushed her prospects, followed each other in rapid succession; and in 1568 she took the next fatal step of her life in landing at Workington and trusting herself to the hospitality of her rival Elizabeth. The Queen of England imprisoned her for 20 years, and at various times the captive queen intrigued to gain her liberty. The plan of her marriage with the Duke of Norfolk gave dire offence to Elizabeth, and her real or supposed

concern in Babington's conspiracy was made the pretext for her removal to Fotheringay in 1586, and her trial and execution in 1587.

Maryland, so called after Henrietta Maria, wife of Charles I., in whose reign it was colonised, is one of the original thirteen states of North America, and is bounded on the N. by Pennsylvania and Delaware, on the E. by Delaware and the Atlantic, and on the S. and W. by Virginia and West Virginia. The state is of irregular shape, almost divided by Chesapeake Bay and the estuary of the Potomac, and of its 12,210 square miles of area water occupies 2,350. The length from E. to W. is 200 miles, with a width varying from 4 to 120 miles. There are no harbours on the coast-line, which is bordered by a shallow lagoon, but Chesapeake Bay, which is the largest inlet of the United States of America, and is 12 miles wide at the entrance between Capes Charles and Henry, and stretches N. for 200 miles with an average width of 10 miles increasing in parts to 40, has a deeply-indented shore-line, and contains many islands. The district to the E. of Chesapeake Bay, called the Eastern shore, is mostly level, while the peninsula between the Potomac and the W. of the bay is more undulating. The third part of the state rises to the mountainous land of the Blue Ridges and the Alleghanies. The Eastern shore has the rivers Pocomoke, Nanticoke, Choptank, and Elk, which are not navigable for any considerable distance. The Susquehanna falls into the head of the bay, and on the W. shore the Potomac is navigable for 125 miles to Washington city, the Patuxent for 40 miles, and there is the Patapsco, on which Baltimore is situate. All the rivers but one flow into Chesapeake Bay. The state produces good marble, chromium, soapstone, iron and copper ore, brick and porcelain clay, and in the W. are coal-fields, especially in one valley 20 miles long, where there is a seam of good steam coal 14 feet thick, besides iron ore. The soil of the Eastern coast and of the west peninsula is sand and clay, and is most productive of peaches and other fruits. The central districts and the mountain valleys are fertile, and there is much original forest in the W., the chief timber being oak, chestnut, beech, cedar, and (till lately) walnut. The bay and estuary abound in fish and waterfowl, among the latter being the canvas-back duck, and the oysters are renowned. The present capital is Annapolis, where is a State Naval Academy, but the mother-city was Baltimore, and this is also the chief port. Much traffic is carried on by the Chesapeake and Ohio Canal, Chesapeake and Delaware Canal, and the Baltimore and Ohio railway. The chief agricultural products besides fruit are tobacco, maize, and wheat; there are iron, steel and cotton manufactures. The original grant of the estate was made to Lord Baltimore, and 200 emigrants founded the settlement in 1634. As Lord Baltimore was a Catholic, the state became a refuge for Catholics, but religious toleration was practised.

Masaccio, TOMMASO GUIDI (1402-1429), an Italian painter, showed an early inclination for art, and in 1424 entered the Guild of Painters at Florence, afterwards studying at Pisa and Rome.

At Rome he executed some frescoes, *A Crucifixion*, and *Scenes from the Lives of St. Catherine and St. Clement*. But his name is chiefly associated with the Brancacci chapel at Florence, where, though some doubt exists as to what is his and what was done by Filippino Lippi and others, much of his undoubted work exists. Among this *The Temptation of Adam and Eve*, *The Expulsion from Eden*, and *St. Peter Baptising* are especially notable.

Masai, a large and powerful predatory people of East Equatorial Africa, whose ill-defined territory (Masailand) lies mainly on both sides of the equator on the elevated steppe lands between Lake Victoria and the Kilimanjaro and Kenia highlands, and stretches from about the parallel of Lake Rudolf (Samburo) southwards to Unyamwezi. But the Masai raids have in recent times extended far beyond these limits, the coastlands both about and below Mombasa having frequently been visited by these dreaded marauders during the present century. Their power, however, is now regarded as practically broken, partly by the establishment of orderly government in the territory of the British East Africa Company, partly by the fearful ravages of the cattle plague, which has wasted a great part of East Equatorial Africa for several years, and has thus deprived the Masai nomads of their main resource. Some have already offered to take service as police or carriers under the company; while others, like their Wa-Kwafi kindred in a previous generation, have turned to the peaceful pursuits of husbandry. Their ethnical relations have been much discussed by ethnologists, and present difficult problems, which have not yet been satisfactorily solved. They appear, however, to be a Negroid people of magnificent physique intermediate between the true Sudanese Negroes and the Ethiopian Hamites, inclining more towards the latter than the former both in appearance and in speech. The Masai language, as far as it has been studied, would seem to belong to the Hamitic Galla group; and, should this view be confirmed, it will be safe to conclude, as is now generally assumed, that the Masai are fundamentally Gallas greatly modified by long contact with the surrounding Negro populations. This conclusion is also confirmed by their traditions, their predatory habits and their preference for a nomad pastoral over a settled agricultural life. Joseph Thomson, by whom they were first visited and described (1883-84), speaks of the superior clans as "splendidly-built savages, the most magnificently-modelled men conceivable, not one under six feet," with straight European nose, thin, well-cut lips, prominent cheek-bones, jaws rarely prognathous, black hair, "a cross between the European and the Negro," and figures in general suggestive less of strength or of "the ideal Hercules" than of the Apollo type, "presenting a smoothness of outline which might be called almost effeminate" (*Through Masailand*, p. 427). The Masi, who call themselves Iloikob ("Freemen"), are divided into about twelve noble or superior clans, the *élite* of the nation, who owe each other no kind of allegiance and under whom are the Andorobbo and other servile tribes not regarded

as of pure Masai descent. The nobles do all the fighting and raiding, while the serfs till the land, carry on all trading transactions with the surrounding peoples, and hunt the elephant in the wooded districts. In the noble clans there are again two distinct classes, the old people who stay at home, marry, and tend the cattle, and the young men occupied exclusively with war and plundering expeditions. Polygamy, and even promiscuity, prevail, and their religion, which rejects a future life, is limited to a vague belief in *Ngai*, a mysterious being enthroned on the snowy heights of Kilimanjaro. There appear to be also one or two inferior deities; but their chief faith is in the *leibon*, wizards or medicine-men credited with supernatural powers, whose chief business is to propitiate, or turn away the wrath of *Ngai*. No Christian missionaries have yet undertaken the conversion of these lawless nomads.

Masaniello, TOMMASO ANIELLO (1623-47), a fisherman of Naples, became the chief instrument of a revolt against the tyranny of the Spanish viceroy, though the real moving spirit was a priest, who remained in the background. The immediate pretext for the revolt was a heavy tax levied upon fruit in 1647. The mob, under Masaniello's guidance, burnt the houses of some who were obnoxious to them and pillaged the city of arms, but not interfering with other property. He at first bore his honours meekly, and was able to dictate terms to the viceroy; but soon his mind gave way, and he committed so many extravagances that the populace wearied of him, and he was confined in a monastery, where he was assassinated. After his death a reaction set in, and he received a grand funeral.

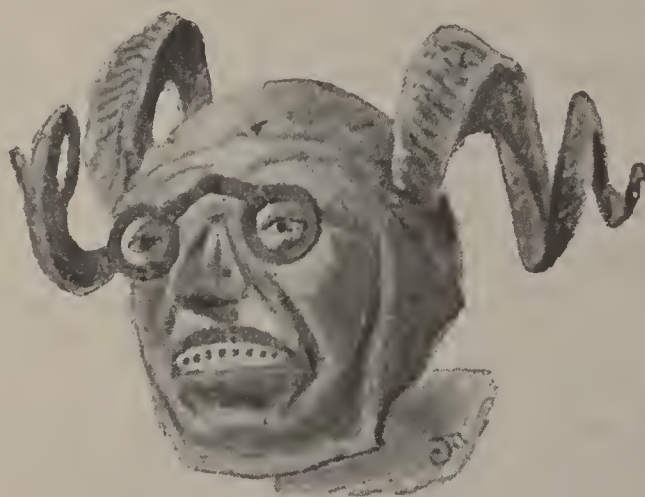
Mashonaland, that part of East Africa S. of the Zambesi and containing many affluents of the Zambesi and Limpopo. It is a plateau of 4,000 feet high, extending to the Umvukwee Mountains, and enjoys a healthy climate; while there is good soil, plenty of grass and water, and other elements of making a successful colony. The people, who are fairly well civilised for Africans, were driven to the mountains and much harassed by the Matabili (q.v.). They are good husbandmen, and before the arrival of the Matabili possessed great herds. They are good iron-workers, and they cultivate rice, maize, corn, cotton and tobacco. Iron, copper, and gold are found, and traces of gold-mines have given rise to the idea that the Ophir of antiquity was here. The region was taken under British protection in 1888, and by an arrangement with Lobengula, the chief of the Matabili, Colonel Pennefather made an expedition in 1889 and founded the town of Salisbury. The British South Africa Company undertook to administer the region in 1890, but the turbulence of the Matabili caused trouble. The Beira railway is now open, and a good road affords communication with Salisbury.

Mashonas, a large but feeble Bantu nation representing the aboriginal element in the region between the Limpopo and the Zambesi, but during the present century driven by the intruding Matabilis to the hilly northern plateau, which from them

takes the name of Mashonaland, and which is now being occupied by British settlers under the Chartered South Africa Company. The Mashonas have eagerly accepted the British protectorate as their best defence against the plundering Matabili hordes; but, being regarded by the Matabilis as their legitimate prey, the standing feud between the two peoples has already brought the white settlers into collision with the Matabili, and the settlement will continue to be threatened by these fierce Zulu warriors until their military organisation is broken. The Mashonas are themselves an inoffensive, industrious people, who till their lands with great care, raise cotton crops, with which they spin and weave coarse textiles, show much skill in basket-work and in the manufacture of iron implements. They have also long worked in a primitive way at the rich alluvial and quartz gold diggings of the plateau; but they have been greatly reduced by the periodical raids of the Matabili, their number having fallen from about 400,000 to 100,000 during the last few decades. The most comprehensive accounts of the Mashonas are those of Montagu Kerr and F. C. Selous.

Masinissa, a Numidian prince of the 3rd century B.C., whose possessions on the borders of Carthage during the struggle of that state with the Romans enabled him to play an important game between the two powers. He first fought for Carthage in Spain against the Scipios, but in 206 he cast in his lot with the Romans. By the aid of Scipio he overcame his rival, Syphax, and firmly established himself. At the battle of Zama he commanded cavalry in Scipio's right wing, and his possession of all Numidia enabled him to harass Carthage and bring about the third Punic War, which crushed Carthage. He was an able ruler, and greatly advanced the good of his country.

Mask, MASQUE, a covering for the face with orifices before the eyes, nostrils, and mouth. The masks of Greek and Roman drama had hair attached



JESTER'S MASK (TIME OF HENRY VIII.).

to them, and it is thought that they generally covered the whole of the head and neck. Characters which did not present some special peculiarity of face were represented by typical masks, the types being numerous. The masks used in masquerades are generally screens which cover the upper part of the

face down to the mouth or to the tip of the nose, with openings before the eyes. The word *mask* used to be applied to a masked revel or masquerade, in which those who took part were disguised by masks. In the form *masque* (formerly also *mask*), the term denoted a pageant of a dramatic character generally based on allegorical or mythological subjects. Such pageants were in vogue during the 16th and the early part of the 17th centuries, and they developed into musical dramas. Ben Jonson and Milton composed masques.

Maskelyne, NEVIL, D.D., F.R.S. (1732-1811), was for nearly half a century Astronomer-Royal. He was born in London, and educated at Trinity College, Cambridge, of which he became fellow. In 1761 he was sent by the Royal Society to observe the transit of Venus at St. Helena, and during the voyage he introduced the practice of calculating longitude by lunar distances. In 1763 he went to Barbadoes to test chronometers, and in 1765 became Astronomer-Royal. He induced the Government to print annually his observations, a practice which has been continued with much advantage; and he was founder of the *Nautical Almanac*, which was first issued in 1766, having had a predecessor in the *British Mariner's Guide* (1763). Selections from his works were published in 1812. He also took interest in geodesy, and was concerned in the finding of the earth's density by means of experiments made at Schiehallion.

Mason, JOSIAH, SIR (1795-1881), renowned as the principal manufacturer of steel pens, was born poor at Kidderminster, but soon came to the front. His first important work was a share in the manufacture of split rings, and in 1829 he began to make pens for Perry and Co. From 1842 to 1865 he was a partner in the Elkington firm for electroplating, and bought a valuable patent from Siemens, and later he bought from Krupp for £10,000 a patent for rolling machinery. He was a generous man, founding the Josiah Mason College, Birmingham, an orphanage at Erdington at a cost of £260,000, and several almshouses.

Mason and Dixon's Line, in the United States, the boundary between Pennsylvania on the north and Maryland on the south, lat. 43° 30' N., named after the first surveyors; formerly the northern boundary of the Slave States.

Masrium, a new element, the probable existence of which in Egyptian minerals has lately been shown. As yet, however, nothing of importance is definitely known concerning it.

Mass. The celebration of the Lord's Supper, or Eucharist; it is generally used of the celebration in the Roman Catholic church. In music, a setting of such portions of the Latin liturgy of the Eucharist as are adapted for musical performance, including the *Kyrie*, the *Gloria*, the *Credo*, the *Sanctus*, the *Benedictus*, and the *Agnus Dei*. [REQUIEM.]

Massachusetts, a New England state of North America, one of the original thirteen. It is of irregular shape, having a length of 160 miles, with an average width of fifty; and Massachusetts Bay

on the east has 250 miles of coastline. The area is 8,040 square miles. In the south of the bay are the islands Martha's Vineyard (21 miles long by 6 broad, a great summer resort), Nantucket (inhabited by fishermen), and Elizabeth Island. On the coast are low plains with many small lakes; but the interior is undulating, and rises on the western boundary into two ranges, part of the Green Mountains, one of which—the Hoosac range—separates the Connecticut River from the Housatonic Valley, and the Merrimac, which flows 35 miles N.E., while the Taconic range, on the west of the Housatonic Valley, rises in the Saddleback to a height of 3,505 feet. The heights are generally well-wooded, and there are in the state nearly half a million acres of wood. While the east is rocky and sterile, along the river valleys and elsewhere the soil is fertile, and agriculture is advanced, though the importance of the manufactures now throws the agriculture into the shade. Granite, sandstone, and marble, are quarried. The rivers give plenty of water-power, and there is much manufacture of cotton, woollens, worsted, boots, shoes, leather, iron, etc. Boston, the great literary centre of the United States, is the sea-port and capital, and there are many other important towns, some of which have specialised industries. At Cambridge is the celebrated Harvard University, and education generally is well advanced in the state. Northmen are said to have founded a colony here, but it was in 1620 that the Pilgrim Fathers landed at Plymouth in the *Mayflower*, and in 1692 that this settlement united with another, formed by Endicott and his Puritans at Salem in 1628, and that the two became one colony, which retained much of its Puritan character till the 19th century was well advanced. It was in this state that the Revolution began which separated the States from the mother country.

Massage, a system of treatment which consists in the mechanical manipulation by stroking, rubbing, kneading, etc., of the various parts of the body, with a view to improving muscular nutrition, aiding the removal of waste products from the tissues, promoting the circulation of the blood, and the like. Massage has been employed with benefit in certain forms of paralysis, in joint affections, sciatica, in dropsical effusions, and for the relief of certain conditions of the stomach (dyspepsia, dilatation of the stomach, etc.), as also in neuralgia, insomnia, and hysteria.

Massena, ANDRE (1758-1817), a celebrated French general, was born of Jewish parentage at Nice, and served for four years in the Sardinian army. In 1792 he joined the French army as a volunteer, and the next year was elected colonel, and made general of division. He won many victories in Italy, the principal being that of Loano (1795), and then went to Switzerland, where he performed many brilliant exploits. He returned to Paris, and was a member of the Corps Législatif in 1803, Marshal in 1804, when he received the Grand Eagle of the Legion. Napoleon sent him to Italy to put Joseph on the Neapolitan throne, and he then joined Napoleon in Poland, where his services

gained for him the Dukedom of Rivoli, and after Eckmühl and Wagram he was made Prince of Essling. He was then sent to Spain, where his genius had to give way before that of Wellington, though Massena himself held that his disasters were brought about by the disobedience of Ney and others. After this campaign he was practically relegated to obscurity.

Massenet, JULES (b. 1842), a French composer, was born near St. Étienne, and studied under Ambrose Thomas at the Conservatoire of Paris. In 1863 he won the Prix de Rome, and soon established his fame as a successful composer. Among his best known works are the operas *Don César de Bazan*, *Manon Lescaut*, *Roi de Lahore*, and the oratorios *Marie Madeleine* and *Ève*. Massenet was appointed professor of composition at the Academy in 1878.

Massillon, JEAN BAPTISTE (1663-1742), a great French preacher, was born at Hyères. In 1681 he entered the Oratory, and achieved success as a preacher. He entered, however, a more severe order, only to be brought back to the Oratory by Cardinal de Noailles. He came to Paris, and preached before the Court in 1699. It was not, however, till 1717, under the regency, that his abilities were rewarded by the see of Clermont. In 1719 he was elected to the Academy, and for a time he preached regularly at Court. In 1723 he preached for the last time in Paris, and then spent 20 years in his diocese.

Massinger, PHILIP (1584-1640), an English dramatist, was at Oxford from 1602 to 1606; but there is little knowledge of his life, and most statements about him are conjecture. In 1621 his first play was produced at Court. From the character of his *Virgin Martyr* (1620), which deals with the story of St. Dorothea and resembles one of the old miracle-plays, the *Renegado*, the hero of which is a Jesuit priest, and the *Maid of Honour*, it has been thought that he was a Catholic, but nothing is known for a certainty upon this head. Of his many plays 19 only are extant. Of these one of the best known is *A New Way to Pay Old Debts* (1633). Others are a *Roman Actor*, which was his favourite among his productions, the *Bondman*, the *Duke of Milan*, and the *Grand Duke of Florence*.

Masson. DAVID (b. 1832), was born at Aberdeen, and educated at Aberdeen and Manchester. At 19 he became editor of a provincial paper, and afterwards a member of the staff of W. and R. Chambers. In 1847 he came to London, where he wrote in reviews, and contributed to the *Encyclopædia Britannica* and the *English Encyclopædia*. In 1852 he became Professor of English Literature at University College, London, and in 1865 Professor of Rhetoric and English Literature at Edinburgh. From 1859 to 1868 he was editor of *Macmillan's Magazine*. Among his best-known works are *Essays* (1856), his *Life of Milton*, six volumes, his edition of Milton (1874), and his *De Quincey* (1878), written for the *English Men of Letters* series.

Massorah, MASORA(H), MAS(S)ORETH, the "tradition," or body of traditional and authorita-

tive comments on the text of the Old Testament, often in the form of marginal notes embodying various readings, grammatical comments, and interpretations. There are two versions, of which the Eastern or Babylonian is more important than the Western or Palestinian. They comprise the notes of a long series of Jewish scholars, and established the system of Hebrew vowel points.

Massowah, a town on a coral island off the W. coast of the Red Sea. lat. 15° 36' N. and long. 39° 28' W. The town is in the W. of the island, which is only half a mile long, and is connected by a causeway, 1,610 yards long. The climate is hot and unhealthy, but Massowah is next to Suakim in importance as a Red Sea trading-place. The chief industries are the gathering of pearls and mother-of-pearl, some weaving, and fishing, and the exports are pearl, mother-of-pearl, skins, gums, ivory, wax, and gold. The island was given by Turkey to Egypt in 1866, and was occupied by Italy in 1885. The natives are of the Ethiopian race.

Master, a name sometimes given to the head of a College at the Universities. In the navy, a rank now disused. Previous, however, to 1866, the master was an officer ranking immediately below lieutenant. In that year masters were given the title of navigating-lieutenants. At present the class of navigating-lieutenants is undergoing gradual abolition, and ordinary lieutenants are assigned to specially undertake the navigation of ships.

Master and Servant, the relationship arising out of the contract of hiring. Such contract may either be for an expressly definite period or for an indefinite or unexpressed period, but a general hiring, in the absence of any custom to the contrary, is presumed to be a yearly hiring, and in all cases a hiring at so much per month is hiring for a year. With regard to domestic servants, such hiring may be determined by a month's notice or a month's wages in advance, given or paid at any time; but in the case of clerks and superior servants the hiring, if general, is construed to be a hiring for one year, and so on from year to year, and must be determined with the year, at least in the absence of misconduct. Every person suffering himself to be hired as a skilled artisan warrants that he possesses the requisite ability and sufficiency, and upon proof of his want of such ability or sufficiency, *i.e.* his incompetency, his employer may discharge him. The not providing with food, etc., or ill-treatment of a servant by his master, is an indictable offence, and punishable, on summary conviction, by a fine of £20 or six months' imprisonment, with or without hard labour, under the Conspiracy and Protection of Property Act, 1875, which repealed many earlier Acts and provides that in trade disputes no agreement or combination shall be indictable, unless the act contemplated would be indictable if done by one person, while it also makes special criminal provisions in the case of persons employed by gas and water companies. It imposes penalties on masters for not taking proper care of their servants, and on persons intimidating or using threats or

violence to others, and provides for a summary process in such cases, with an appeal to Quarter Sessions. By statutes passed in the reign of George IV. and the present reign, provision is made for arbitration between workmen and their employers in case of trade disputes, and by the Employers and Workmen Act, 1876, special powers are conferred on County Courts as to obtaining payment of money set off and rescission of contracts, and taking security for performance of contracts in trade disputes between employers and workmen; and the same jurisdiction is given to justices by the Act up to the value of £10, which extends also to disputes between master and apprentice.

Master of Arts, usually abbreviated to M.A., an academical degree following that of Bachelor of Arts (B.A.).

Mastic, the resinous exudation of the bark of *Pistacia Lentiscus*, an evergreen shrub belonging to the terebinth family and native to the Mediterranean region. It is mainly collected in the island of Scio, of which it forms the chief source of revenue. It is obtained from artificial incisions between June and September, one tree yielding 8 or 10 lbs. a year. From 200 to 250 tons are extracted annually, the best going to Constantinople, Trieste, and Marseilles. It is soluble in turpentine or ether, but only partly so in cold alcohol, and is used by dentists and varnish-makers. *East Indian* or *Bombay mastic* is the product of *P. Khinjuk* and *P. cabulica* in Sindh, Afghanistan, and Baluchistan; and *P. atlantica* yields a similar resin, which is chewed by the Arabs of Algeria. *Cape mastic*, used in South Africa, is obtained from *Euryops multifidus*, one of the Compositæ.

Mastiff, a name for a European and an Asiatic breed of dogs of large size and noble appearance. The origin of the English mastiff is lost in obscurity. The original breed has been much modified by crossing with the St. Bernard, the boarhound, and the bull-dog. The average height of the English mastiff at the shoulder is from 28 to 30 inches, and the chest girth should be at least a third as much. The body is long and cylindrical, with a smooth coat, the limbs stout and strong, the feet round and close, and the tail thick, but not bushy. The ears and lips are pendulous, and dogs are now bred with the head much shorter, the muzzle more nearly square than was the fashion ten years ago. The general colour is fawn, with dark or black muzzle, ears, and feet. Dogs of the old breed were fierce and courageous; the mastiffs of the present day are kept as companions and watch-dogs. The Tibet Mastiff is a little smaller, and has a rough coat; and similar dogs occur in other parts of Asia.

Mastigophora, a primary group of Infusoria (also known as FLAGELLATA). They are distinguished by the flagellum from the Ciliata, Acinetæ, and Tentaculifera.

Mastodon, a genus of fossil Proboscidea, closely related to the elephants, from which they differ only in their teeth. They had two incisors or tusks in the upper jaw, but slightly curved, and

sometimes furnished with longitudinal bands of enamel on their surface. There were sometimes also a pair in the lower jaw. The molar teeth had fewer ridges than those of elephants, scarcely any cement between them, and conical cusps, whence the name (from the Greek *mastos*, "nipple"; *odous*, "tooth") is derived. Mastodon occurs in the Miocene and Pliocene rocks of the Old World, two species occurring in the English Crag; but in North America they survived into Pleistocene times. Their remains have been found in India, in the Andes, and perhaps in Australia.

Masts, the nearly perpendicular timbers, or steel tubes, to which are attached the rigging, yards, and sails of a ship. A mast is either of one piece, in which case it is a "pole-mast," or it is composed of several sections, each of which also retains for itself the name of mast, and each of which, if large, may, in turn, be built up of several timbers. When a vessel has two masts, the foremost is the foremast, and the aftermost the main. Where there are three, the foremost is the foremast, the middle is the main, and the aftermost is the mizen. Each of these masts may consist of as many as four principal sections raised one above the other, and known, respectively, as the lower mast, the top-mast, the topgallant mast, and (though this is a rare addition) the topgallant-royal mast. Extra masts aft of the mizen are termed jiggers or spankers. Lower masts are now very generally made of iron or steel. In days when ships depended exclusively, or even chiefly, on sail power, the dimensions of masts were generally larger than at present.

Masulipatam, a town and seaport of the Kistna district, in the Madras Presidency, India, 215 miles N. of Madras. Once it was renowned for its chintzes on account of the brilliance and permanency of the dyes, and some weaving and printing is still carried on. It is an important missionary station. An agency was established in 1611, and a fort in 1622. In 1864 a storm wave caused much damage and the loss of 30,000 lives.

Matabililand is a district lying N. of the Transvaal and between the Zambesi and the Limpopo, having a length of 180 miles and a breadth of 150 miles. The *Matabili* (Amandebeli) are a mixed Zulu people, who under their chief, the fugitive *induna* (captain) Umsilikatze, first settled about 1828 in the Marico district, on the borders of the present Transvaal and Bechuanaland. Driven thence in 1837 by the Boers, Umsilikatze led a motley gathering of Zulus and Bechuanas across the Limpopo, and established himself at Bulawayo in the Matoppo Hills, where he introduced the Zulu military system and founded the present kingdom of Matabililand. The occupation of the country was thus from the first of a purely military character, and the royal kraal at Bulawayo was in the nature of a hostile camp planted in the midst of the peaceful and industrious aborigines—Mashonas, Makalakas, and Banyai—against whom were organised periodical plundering expeditions, which have been continued with little intermission down to the present day. After an interregnum

of two years following the death of Umsilikatze in 1868, his second son, Lo Bengula ("The Defender"), was chosen by the indunas as his successor, although the eldest son, Kuruman, was living, and is by many believed to be still alive. Lo Bengula continued the old system in its full rigour, claiming the paramount lordship over the whole region from the Limpopo to the Zambesi, and extending his predatory expeditions with varying success eastwards to Gazaland, and westwards to Lake Ngami. But he was induced in 1892 to come to terms with the British South Africa Company, surrendering in their favour his pretensions to Mashonaland, and allowing them to peacefully occupy that country. [MASHONAS.] This arrangement, however, was viewed with disfavour by the more warlike indunas and *impis* (armed and disciplined bands), which had hitherto lived by rapine and murder, and which have now (1893) forced Lo Bengula to break his engagements with the company, and renew the periodical marauding expeditions to Mashonaland. Although claiming to be full-blood Zulus, the Matabili are a very mixed people, forming, according to their diverse origin, three distinct classes: (1) *Abasanzi*, descendants of the original Zulu tribe led into the Transvaal by Umsilikatze; (2) *Abentla*, descendants of the Bechuana captives incorporated in the Marico district; (3) *Amaholi*, descendants of the Mashona, Makalaka, and other captives incorporated in Matabililand. These heterogeneous elements are reflected in the mixed character of the language (*Insidebeli*), which is a degraded or simplified Zulu dialect, full of numerous words and expressions borrowed from the various subject peoples. The territory is divided into four military circles commanded in time of war by four head indunas (generals), and capable of mustering from 15,000 to 16,000 men armed with assegais (spears and darts), clubs, shields, and a few muskets. The power of the king is absolute both in time of peace and war, and extends to the lives and property of all his subjects. A controlling influence is, however, exercised by the Council of Indunas, to whom civil and criminal cases are often referred. The criminal code is excessively severe, cowardice or even failure in the field, as well as all other military offences, being almost invariably punished by death. Such sentences are carried out either by the *hammer* (clubbing), the *rope* (hanging), or the *pillory*, in which the culprit is lashed to a tree and left to his fate. Fire, mutilation, and stoning are inflicted for social offences. In other respects the Matabili political and social organisation differs little from that established in Zululand by Chaka at the beginning of the present century. (Moffat, J. Mackenzie, Montagu Kerr, Anderson, Selous.)

Matanzas, a city and sea-port in the N. of Cuba, 55 miles E. of Havana, with which it is connected by rail. It is well-built, and has a good harbour sheltered from most winds. There are distilleries and iron-foundries, and sugar, rum, molasses, and cigars are exported.

Matches. The most primitive mode of obtaining fire, and that still practised by many savage

tribes, was by the rubbing together of pieces of wood. The next step was the use of pyrites and steel, by the striking of which sparks were obtained, which set alight pieces of dried cloth or other combustible material—the tinder. The first matches consisted of sulphur-tipped pieces of wood, which were set alight by the ignited tinder. At about the beginning of the present century a form of match was invented consisting of a wood splint, the end of which was coated with sulphur, sugar, and potassium chlorate, and which was ignited by dipping into a bottle containing asbestos soaked in strong sulphuric acid. This method presented obvious objections, and many other devices appear to have been tried and some forms of friction matches invented. None, however, met with any success, until a friction match known as the Congreve was brought out. Congreve matches consisted of wood splints dipped in molten sulphur, and tipped with a mixture of potassium chlorate and sulphide of antimony. These were ignited by drawing between pieces of sand-paper. Various improvements soon followed, and in 1833 phosphorus was used to replace the antimony sulphide, and matches almost like those in present usage were produced in various localities. The use of paraffin instead of sulphur for the dipping the splints did away with the noxious fumes and was commonly adopted; sulphur is, however, largely employed for cheap Continental matches. In the manufacture, on a larger scale, many practical difficulties had to be overcome, and much mechanical ingenuity has been spent in perfecting machines for cutting and shaping the wood, etc. The wood is first cut into circular blocks, and then turned upon a form of lathe, where a suitably-arranged cutter strips off a continuous strip of wood of the thickness of a single match. These strips are cut into single splints, dried, and then by ingeniously-conceived mechanism dipped into (1) melted paraffin, (2) the mixture that forms the head. They are then carefully dried and boxed. The igniting mixtures usually consist of potassium chlorate, or nitre and phosphorus, coloured with some pigment as red-lead, umber, etc., and made into a paste with gum. Safety matches were first invented by Bryant and May in 1855, and differ from the ordinary kind as they contain no phosphorus in the head of the match, which is composed of potassium chlorate, potassium bichromate, red-lead, and sulphide of antimony. The rubbing surface is coated with the non-poisonous amorphous or red phosphorus, and for ignition the matches must be rubbed upon this surface only. Cotton dipped in melted paraffin and wax is also employed in place of wood splints for the wax vestas largely used by smokers. Fusee matches, vesuvians, etc., consist of matches with large heads composed of some porous material, as bibulous paper, charcoal, etc., saturated with nitre solution, dried, and tipped with the ordinary igniting mixture. In America the manufacture is subject to a tax, and is an important source of revenue. In France it is carried on as a Government monopoly. In Germany it is well established amongst a large number of firms. In England two firms produce almost all the matches employed

i.e. Bryant and May, London, and Bell and Black, Glasgow. Of late years the manufacture has been increasing very largely in Norway and Sweden, the Swedish matches being very extensively employed.

Mate, an old naval rank equivalent to the modern one of sub-lieutenant, in favour of which it was abolished in 1861. "Mate" in the navy now means "assistant," and is applied to various petty officers, as, for example, boatswain's mate, carpenter's mate. "Signal mate" is still the colloquial name for the sub-lieutenant to whom the management of a ship's signals is assigned. In the mercantile marine "mate" is the title of any officer who performs such duties as in a man-of-war would be performed by a lieutenant.

Maté, or PARAGUAY TEA, the dried leaves of *Ilex paraguayensis* and allied species of holly growing in Paraguay and south Brazil, furnishes the chief non-alcoholic drink of South America. Though used immemorially by the Indians, the tree was first cultivated by the Jesuits. The dried leaves are packed in *serons* or raw hides containing about 200 lbs. each. The infusion is prepared in a calabash or *maté*, usually silver-mounted, boiling-water and sugar, with milk or lemon-juice, being added to the leaves (*yerba*), and the beverage taken very hot through a metal or reed tube or *bombilla* with a strainer at one end. Maté contains 1.85 per cent. of caffeine, acting as a restorative, much as tea does; but, being bitter, the taste for it has to be acquired.

Materialism, the denial of the existence of any substance except matter, and of any force except what is derived from the eternal properties of matter and from the motions of material bodies, molecules, or atoms. This doctrine involves the negation of the ideas of "soul" and "spirit" and of "deity" (except on a pantheistic hypothesis), and the explanation of mental phenomena in terms of chemical and mechanical change. One of the earliest materialists of western antiquity was Thales of Miletus, while Leucippus, Democritus, and Epicurus taught divers forms of atomic materialism; but these ancient philosophers did not entirely reject the gods of Greek mythology.

Materia Medica is the science which deals with the materials used in medical treatment, their names, source of origin and composition, the preparations which are made from them, their properties, actions and doses. PHARMACOPŒIA, and various articles: LINIMENTS, TINCTURES, ETC.; APERIENTS, DIURETICS, ETC.]

Mathematics is the science of number. Any quantity requires for its complete expression a representation of its magnitude; if it only requires this, it is termed a number, and the study of such representation is termed *notation*. Most quantities occurring in nature are, however, more complex; not only do they require magnitude, but also a knowledge of the standard of comparison. A simple length, for instance, requires a number and a unit, as three feet, thirty-six inches, or one yard. Here the same physical quantity is represented by entirely different numbers—3, 36, and 1 respectively

—there being in each case different standards of comparison—viz. the foot, the inch, and the yard. The correct distinction may at once be inferred between pure and applied mathematics. The former studies pure number and the relations between numbers; the latter involves the use of various units or standards of comparison. But, on the other hand, the study of pure number is in many cases simplified by attaching meanings to the quantities involved, beyond what they actually hold. The product of two numbers, for example, is often more clearly understood when the numbers themselves are assumed to represent lengths, and their product an area. On this account, pure mathematics deals with elementary units to an indefinite extent, and applied mathematics is made to cover chiefly those branches of the science that involve more intricate units, such as those of force or energy. Numbers are conveniently represented by lines, and investigation by such graphical means is the principle of *geometry*. This branch may involve a study of space-relationships that are apparently independent of magnitude, but even in such cases there is a connection, though its nature may be so intricate as to remain unexplained. When numbers are represented for brevity by symbols, such as letters of the alphabet, combined with other symbols, denoting operations performed on these numbers, such as raising to given powers, or the extracting of given roots, we enter the domain of *algebra*. The properties of points, lines, areas, and volumes in space may be investigated entirely by means of their position and magnitude, without the use of notation system; this is *pure geometry*. Or they may be investigated with the aid of ordinary numbers, or symbols representing ordinary numbers; this is *analytical geometry*. These properties are specially studied in the case of triangles and polygons in connection with angular measurement, and lead to *trigonometry*, *plane*, in the case of figures lying in one plane, *spherical* in the case of curvilinear figures that lie on the surfaces of spheres. The infinitesimal calculus deals with small increments in variable quantities, and must be regarded solely as a method, though an exceedingly powerful one, for prosecuting algebraic research; its two chief branches, the differential and the integral calculus, are converse in their nature, as multiplication and division, though it is nearer to the truth to define their difference as being that between analysis and synthesis. Applied mathematics is many-headed; all branches of natural philosophy require applications of mathematics, and an advance of knowledge in any branch may be often initiated by purely mathematical reasoning. The most direct applications are to the study of force in dynamics, while this subject again is continually introduced in physical questions, such as those on light, heat, magnetism, electricity, chemistry, or astronomy; but the connection between these sciences is too intimate to allow us to further subdivide the subject of applied mathematics.

Mather, the name of a celebrated New England family which for four generations exercised great

influence in the colony. RICHARD was born in Lancashire, educated at Oxford, and went to New England in 1635. INCREASE (1638-1723), son of Richard, was educated at Harvard, and visited England. He came to Boston, where he was pastor and president of the college, and represented the colony to the English Government. He wrote many books and tracts. COTTON (1663-1728) graduated as B.A. at Harvard in 1678. His father had married a Miss Cotton, and the son bore the two names which were almost equally honoured in the colony. For forty-three years he occupied the pulpit, having many good qualities, and some defects. He was energetic, ascetic, philanthropic, courageous, and learned, but at the same time ambitious, obstinate, irritable, superstitious, and wanting in tact.

Mathew, THEOBALD, FATHER (1790-1856), the "Apostle of Temperance," was born in Tipperary and educated at Kilkenny and Maynooth. From 1808-14 he lived at Dublin, where he was ordained priest, and joined the Capuchin Order. He went then on a mission to Cork. In 1848 he founded the Total Abstinence Association, and the enthusiasm he created caused the movement to spread like wildfire. In 1844 he visited Liverpool, Manchester, and London. His labours and travels involved him in debt, but in 1847 he received a pension of £300. The year 1850 he spent in the United States.

Mathews, CHARLES (1776-1835), English comedian, was born in London and educated at Merchant Taylors'. In 1794 he obtained an engagement at the Dublin theatre, and in 1802 he came to the Haymarket, where he proved a great success. His great power lay in his mimicry and in his variety of facial expression. In 1818 he began his "At Homes" at the Lyceum, and these also met with much success. He was of amiable character, and much liked in private life.

Mathews, CHARLES JAMES (1803-78), son of the above, and also light comedian, was born at Liverpool, and educated at Merchant Taylors'. He first appeared at the Adelphi, and afterwards managed the Olympic, Covent Garden, and Lyceum theatres. Many will remember him in *Cool as a Cucumber*, *Patter and Clatter*, *Little Toddlkins*, and *My Awful Dad*.

Matilda (English, "Maud") (1103-67), daughter of Henry I. of England, married (1115) the Emperor Henry V., and fourteen years later Geoffrey, Count of Anjou, by whom she became the mother of Henry II., whose rights during his minority she stoutly upheld against Stephen, being aided in this by her half-brother Robert of Gloucester. A compromise at last settled the dispute between them. MATILDA was also the name of the wife of William the Conqueror, chiefly remembered for the Bayeux Tapestry and the church she founded at Bayeux.

Matilda, COUNTESS OF TUSCANY, "the Great Countess" (1046-1114), succeeded the duke her father. She was the aunt by marriage of Godfrey of Bouillon, and was renowned for her determined championship of Gregory VII. and the Papal cause during the Great Schism,

in spite of the formidable powers that took part with the anti-Popes. It was at her castle of Canossa that the Emperor Henry IV. had to humiliate himself to the Pope. In 1102 she gave all her possessions to the Church, thus laying the foundation of the Papal States. She was twice married, and was buried in the Vatican.

Matlock, on the Derwent, and the Midland Railway, a watering-place in Derbyshire, 17 miles N.W. of Derby. It consists of four towns—Matlock town, Matlock Bank, Matlock Bath, and Matlock Bridge. At Matlock Bath are three hot springs of great therapeutic reputation, and the scenery of the valley is very fine. Among the show-sights are the High Tor (400 feet), the Heights of Abraham (1,100 feet), the stalactite caverns, and the petrifying wells. There are cotton, corn, and paper-mills, and a good deal of spar is worked into ornaments.

Matsys, QUENTIN (1466-1531), a Flemish painter, was born at Louvain. Tradition makes him a blacksmith who turned painter, and attributes to him the ornamental iron-work over a well near the door of Antwerp cathedral. At any rate, he came to Antwerp in 1491, and forms a connecting-link between the old and newer schools of Netherland painters. His *Virgin and Child with the Marys* was painted for Louvain, and others of his works are the *Burial of Christ*, together with the *Martyrdom of St. John the Evangelist* and *St. John the Baptist*, and two other *Madonnas*, *The Money-Changers*, and *The Gaolers*; he painted portraits also, one of his subjects being Maximilian of Austria.

Matter. In *philosophy* (Aristotle's *hyle*), that which is in itself not definite, but by receiving a form becomes a substance. In *physics*, it has been urged that only two kinds of things are known to exist in the physical world; of these one is matter, and the other energy. Both are indestructible; by no conceivable process can the quantity of matter in the universe be increased or diminished by a single ounce, and this property is known as the conservation of matter. Matter is characterised by its inertia; it always tends to remain in the same state, either of rest or of uniform motion in a straight line, unless some force compels it to change that state. This was enunciated by Newton, and is known as his first law of motion. The most popular idea of matter is that it is something which has size, which can occupy space; and regarding the ultimate structure of matter many hypotheses have been propounded. The Greek philosophers more than 2,000 years ago conceived that matter could be subdivided into particles smaller and smaller until an indivisible *atom* was reached. That these atoms were hard, with space between them, was accepted by Newton; while Bosovich eliminated the material property of the atom altogether, and considered it to be no more than a mathematical point acted on by forces. This theory was not accepted for long, since it was unable to account for the property of inertia. Another theory assumed matter to be continuous—not separated into distinct particles. The most modern theory, propounded by Sir W. Thomson and investigated by Helmholtz, imagines matter to

be merely the rotating parts—vortex atoms—of some fluid which possesses inertia and entirely fills space; this vortex theory is, however, still in its infancy. Some properties of matter are familiar to all, such as its weight, divisibility, cohesion, plasticity, ductility, viscosity, rigidity, elasticity, transparency, colour, capillarity, etc.

Matterhorn. THE (French, *Mont Cervin*; Italian, *Monte Nivio*), an Alpine peak between Piedmont and the canton of Valais, 14,700 feet high. It was climbed for the first time in 1865 by Mr. Whymper, Lord F. Douglas, Rev. C. Hudson, and Mr. Hadow. The last three, with one of the guides, fell over a precipice and were killed.

Matthew, ST., one of the twelve apostles, and the reputed author of the Gospel that bears his name, was a Hebrew tax-gatherer, and seems to have been a man of some position. We read of his giving a feast and being in the upper room where Matthias was chosen in the place of Judas. According to Eusebius, he spent his later years at Jerusalem teaching the Jews, and in going on foreign missions, one being to Ethiopia. Some authorities say that he died a natural death, others that he was martyred.

Matthias Corvinus (1443–90), King of Hungary, was born in Transylvania, being the younger son of John Hunyadi, who died in 1456, after being governor of Hungary 1446–53. On John's death, his eldest son, Ladislaus, was executed by Ladislaus, King of Hungary and Bohemia, and Matthias was imprisoned at Prague. In 1458 Matthias was elected to the throne, but was not crowned till six years later. He drove out the Turks, fought with the king of Bohemia, quelled the insubordination of his own magnates, and fought with Frederick III. and took Vienna, which he made his capital. He was an ambitious man, and bent on conquest, but was a great patron of arts and letters, and founded an university, observatory, and library. His rule was arbitrary, and his wars caused him to tax his people heavily.

Matto Grosso, an inland province of Brazil bordering on Bolivia. Although it has an area of over 32,000 square miles, it is thinly inhabited, chiefly by Indians and negroes. The rivers Madeira (q.v.) and Paraguay rise here, and vegetation is abundant along the rivers, though sparse upon the plateaus. The chief industries are agricultural pursuits and cattle-rearing. Formerly the district produced gold and diamonds. Capital, Guyabã.

Mauchamp Sheep, a breed of merino sheep remarkable for long, smooth, straight silky wool. They are descended from a merino ram-lamb born on the farm of Mauchamp, near Berry-an-Lac, in the department of the Aisne, France.

Maulmain, a town of Tenasserin, in Burmah, near the mouth of the Salween, formerly (when ceded in 1826) only a waste, but now second only to Rangoon in importance. A range of hills rising behind the town affords a pleasant place of residence, with a fine view. The inhabitants are chiefly Buddhists, Hindus, and Mussulmans. There is some ship-building, and teak, copper, lac, horns, hides, rice, and lead are exported.

Maundy Thursday, the Thursday in Holy Week or before Easter Day, so named from the "mandate" (recorded John xiii. 24) given by Jesus Christ before He washed His disciples' feet, which ceremony is still commemorated in the Latin Church. On this day also the royal bounty of Maundy money is distributed by the Lord High Almoner of British sovereigns in the Chapel Royal, Whitehall. The day is called *Chare* or *Shere* and *Cena Domini* ("the Lord's Supper").

Maupassant, GUY DE (1850–93), a French author, was born in Normandy. He fought in the Franco-German War, and then fell under the influence of Flaubert. As a writer he belongs to the naturalistic school. He wrote a play, some lyrics, and many novels, some of the latter being *La Maison Tellier*, *Contes et Nouvelles*, *Pierre et Jean*, and *Fort comme la Mort*. Towards the end of his life his mind gave way.

Maupertuis, PETER LOUIS MOREAU DE (1698–1759), mathematician and astronomer, was born at St. Malo. For some years he was a soldier, but love for mathematics caused his retirement. In 1723 he became a member of the Academy of Sciences, in 1728 he visited London and was made F.R.S., and in 1733 he was sent to Lapland to measure the meridian in the arctic circle. He spent much time at Berlin, where he married, and died at Basel. He wrote many works on astronomy, *The Laws of Motion*, *The Laws of Rest*, and *Essay on Cosmology*.

Maurice, FREDERICK DENISON (1805–72), author and theologian, was the son of an Unitarian minister. He went to Trinity College, Cambridge, migrating later to Trinity Hall, where he obtained a first class in Civil Law (1827), but could not take his degree owing to his religious views. He then went to London, and became editor of the *Athenæum*, and, falling under Coleridge's influence, he joined the English Church, and became a typical Broad Churchman, though he disliked all party names. Having gone to Oxford and graduated there, he took orders in 1834, and after some experience of parish work, was appointed chaplain to Guy's Hospital, where his sermons attracted many to the chapel. In 1840 he became professor of literature and history at King's College, and of divinity in 1846, but his *Theological Essays* (1853) offended the authorities and caused him to lose his professorships. From 1846–60 he was chaplain of Lincoln's Inn, and from 1860–69 incumbent of St. Peter's, Vere Street. His congregations were composed of a select body of thinkers on whom and through whom he exercised a deep influence. His views upon co-operation and Christian Socialism caused him to be looked on as the workman's friend, and he had much to do with founding the Working Men's College, and Queen's College for Women. In 1866 he became professor of Moral Philosophy at Cambridge. He wrote a novel, *Eustace Conway*.

Maurice, PRINCE OF ORANGE (1567–1625), son of William the Silent, was born at Dillenburg. After his father's death he was elected Stadtholder and, with the aid of the English expedition under

Leicester and Sir Philip Sidney, he beat Spain and gradually won back the Low Countries, which became a free republic in 1609. His endeavours for the good of the country were much hampered by the struggles of parties at home.

Mauritania, the district N. of the Atlas Mountains, in Africa, now Morocco, was separated from Numidia by the Mulucha, though at a later period it went farther E. and stretched from Ampsaga to the Atlantic. It was part of the great granary of Rome, and supplied much timber, especially the renowned citrus.

Mauritius, an island in the S. of the Indian Ocean, 556 miles E. of Madagascar, and 940 S.E. of the Seychelles. It is an irregular triangle in shape, and is 36 miles long by 23 miles wide, and contains 713 square miles. The isle is surrounded by coral reefs, which make approach difficult. It is of volcanic formation, and there are lakes which are old craters, the chief of these being Grand Bassin in the S. The N. and N.E. are comparatively level, but the rest of the island is picturesquely hilly and mountainous, the heights varying from 500 to 2,700 feet. The Pouce (2,650 feet) and Pieter Botte (2,676 feet) are remarkable peaks. The rivers are small, and in the dry season mere brooks, the longest (10 miles) being the Grande Rivière. The climate is pleasant during the cool season, but very hot at other times, and hurricanes are frequent. The soil is fertile; but, owing to its stoniness, cultivation has to be carried on with the hoe. Most necessities of life are imported, and the exports are sugar, rum, vanilla and fibre. Port Louis, in the N.W., is the capital and the seat of government. Most of the officials live in the hills, especially at Curepipe (1,800 feet), where, as at Port Louis, there is a small garrison. There are some railways and fair roads, and good schools. Port Louis has a Roman Catholic bishop, and there is a Protestant bishop of Mauritius. England took Mauritius from France owing to the damage done to our trade by cruisers which sheltered there.

Maurocordatos, the name of a Greek family which has had great influence on the history of their country. ALEXANDER (1637-1709) studied medicine in Italy, and in 1681 became interpreter to the Porte, and had great influence in the Turkish Empire. NICHOLAS, son of above, was Hospodar of Wallachia and Moldavia. CONSTANT, son of above, was Hospodar of Moldavia, and abolished serfdom. ALEXANDER (1791-1865) was born in Constantinople, and played a great part in the Greek struggle for independence. He prepared the Declaration of Independence, and drew up the plan of government, and became President of the Executive Body. In 1822 he saved the Peloponnesus. He was a good worker, and a patriot, but was unpopular through his liking for England and his dislike of Russia. Under King Otho he was minister and ambassador, and was for a time Prime Minister at the beginning of the Crimean War.

Maury, JEAN SIFFREIN (1746-1817), French Cardinal and Archbishop of Paris, and opponent of Mirabeau, whose rival he was in eloquence. He

took orders at Avignon, and came into notice through an *éloge* on Fénelon. In 1772 he published an *Essai sur l'Éloquence de la Chaire* and later *Principes d'Éloge*. In 1781 he was appointed court preacher, and in 1785 was elected to the Academy. In 1792 he became an *émigré*, and went to Rome, where he was looked on as a martyr and was created Cardinal. He afterwards courted Napoleon, and was made Archbishop of Paris, but at the Bourbon restoration was sent to Rome, and was imprisoned in St. Angelo.

Maury, MATTHEW FONTAINE (1806-73), was born in Virginia, and in 1825 became a midshipman, and took part in a four years' voyage of exploration. In 1836 as lieutenant he took part in another exploring expedition. In 1839 an accident lamed him, and he was appointed to superintend the dépôts of charts and instruments. His special study was the laws of winds and currents, and he made a great collection of specially-arranged log-books embodying observations on points which he had brought to the notice of captains. We may trace to the initiative of his efforts the establishment of our own Meteorological Office. His Southern sympathies in the War of Secession brought him troubles, but he eventually returned to Virginia. His first published work was a *Treatise on Navigation* (1848), but his most widely-known work is the *Physical Geography of the Sea* (1855).

Mausoleum, a large, fine sepulchral monument or an edifice built as a burial-place for one person—like the original mausoleum erected at Halicarnassus in Caria, Asia Minor, by Queen Artemisia in the 4th century B.C. as the tomb of her husband, King Mausolus—or for a family, or for the successive holders of some dignified office.

Mauveine, an aniline dyestuff, interesting chiefly as being the first of these substances prepared and used commercially. It was produced by Perkin in 1856 by the action of sulphuric acid and potassium bichromate on aniline.

Maviti (MAZITU), Zulu hordes, which about the middle of the present century crossed the Zambesi and overran the regions between the east coast and Lakes Nyassa and Tanganyika. Later some passed west of Nyassa, while others settled in small groups amongst the Mahenges of the Upper Lufiji and elsewhere. "From the head of Lake Tanganyika to the Zambesi, and from the lakes to the coast, the very name of the Maviti, Mazitu, Matuta—for they are known by these and other names in various districts—causes the native tribes to shudder." (E. D. Young, *Nyassa*, p. 178.)

Maxim Gun, an automatic machine- or quick-firing gun invented by Mr. Hiram S. Maxim about 1883, and since adopted by most Governments. Its distinctive feature consists in the utilisation of the recoil caused by each discharge in order to extract the empty cartridge from, and reload and fire, the gun. It is fed with ammunition from a belt or bandolier, which may be of any desired length; and the rate of fire is controllable, up to about 300 rounds a minute or more. There is only one barrel, which is prevented by a metal water-jacket from becoming

over-heated. The weight of a 1·5 in. 1-pr. gun of this kind is 364 lbs., of its mounting 336 lbs. The gun of rifle-calibre (·303 in. bore) weighs but 50 lbs.

Maximilian I. (1459–1519), Emperor of the Holy Roman Empire, was the son of the Emperor Frederick III., and by his marriage with Mary, daughter of Charles the Bold of Burgundy, became the master of vast possessions. In 1493 he succeeded to the empire. With a view to putting an end to the system of constant private war he decreed a perpetual peace, and created courts and circles, each commanded by a captain, to enforce the decree. He also formed a standing army, an improved artillery, and a system of police. Later he was induced to make an attempt to gain Milan and Naples, and a war with Switzerland in 1499 led to the Treaty of Basel, which well-nigh secured the independence of that country. Maximilian set the example, so well followed in after times, of increasing the Austrian dominions by judicious marriages.

Maximilian, FERDINAND (1832–67), Archduke of Austria and Emperor of Mexico, was born at Vienna, the brother of the Emperor Franz Joseph, and served for a time in the Austrian navy. In 1857 he married Charlotte, daughter of Leopold I., King of the Belgians, and was appointed governor of Lombardy and Venetia. Two years after he retired into private life, from which he was called in 1863 to accept the crown of Mexico, a step which he took by the advice of Napoleon III. He landed at Vera Cruz in 1864, and it soon became apparent that he had greater difficulties to encounter than he had anticipated from the hostility of the population and the disfavour of the United States. In 1867 he was besieged in Queretaro, and, being captured, was tried by court-martial and shot. His fate rendered his wife insane. The discredit his failure brought on Napoleon III. was perhaps the beginning of the downfall of the Empire.

Max Müller, FRIEDRICH, philologist, was born in 1823 at Dessau, where his father was ducal librarian. Educated at Leipzig, where he graduated in 1843, he devoted himself to Sanskrit, and published the *Hitopadesa* in 1844. He then visited Berlin, Paris, and England in search of material, and was commissioned by the East India Company to bring out his edition of the *Rig Veda* (1847). In 1850 and 1854 he was appointed to chairs at Oxford, and in 1858 became fellow of All Souls', since when his life has been chiefly identified with Oxford. Among his many works, perhaps the best-known are *Chips from a German Workshop* and the *Science of Language*. Other works are *Science of Religion* and *Natural Religion*.

Maxwell, JAMES CLERK (1831–79), man of science, was born at Edinburgh, and educated at the Academy and university there. In 1850 he went to Cambridge, and came out as second wrangler and equal for Smith's prize in 1854. He was scholar and fellow of Trinity College. In 1856 he was made professor at Aberdeen, in 1860 at King's College, London, and in 1871 at Cambridge. His chief work is *Electricity and Magnetism*; but he wrote on the theory of heat, matter

and motion, equilibrium of elastic solids, theory of rolling curves, and many other points. He studied also the question of colours and colour-blindness, and made important additions to molecular physics.

Maxwell's Theory of light is that electromagnetic disturbances are propagated through space in waves of the same type as those of light. The theory is supported by dynamical considerations on the transmission of stress through the medium, and also by experiment. [ELECTRICITY, MAGNETISM.]

May, the name of the fifth month of the later Roman and British year—the month *Maius* of the old Roman year—sacred to Maia, mother of Mercury and goddess of Spring. In this month the sun leaves the sign of Taurus and enters that of Gemini.

May, THOMAS ERSKINE, SIR, BARON FARNBOROUGH (1815–86), was educated at Bedford, and became assistant librarian of the House of Commons, rising to the post of Clerk of the House in 1871. He was called to the Bar in 1838, was made K.C.B. in 1866, and retired with a peerage in 1886. His great work, *The Laws, Privileges, Proceedings, and Usages of Parliament* (1844), is of great value, and has been translated into several languages. He also wrote a *Constitutional History of England since the Accession of George III.* (three volumes, 1861–63, and a supplementary chapter in 1871); and *Democracy in Europe* (1877).

Maya, one of the civilised peoples of the New World, whose chief seat was in Yucatan, from them often called *Mayapan*; but the Maya race and culture were spread far beyond this region as far north as Tamaulipas and throughout Guatemala southwards to Honduras. In the 16th century the chief divisions were:—The *Yucatecs* or *Mayas proper* (Cocomes, Tutul-Xuis, Itzas, Cheles) of Yucatan; the *Chiapanecs*, *Lacandons*, *Tzendals*, and *Quelemes* in Chiapas; the *Quichés* dominant in the interior of Guatemala; the *Mams*, *Pokomans*, and *Cakchiquels* in south and south-east Guatemala and north Honduras; the *Huastecs* of Vera Cruz and Tamaulipas. These constitute the *Maya-Quiché* family, all of whom spoke closely allied dialects of the primitive Maya stock language, and most of whom still survive; for of all native races none have shown more vigour and tenacity than the Mayas in preserving their national characteristics, usages, traditions, and languages. In Yucatan they still form compact masses, little affected by Spanish influences, and on the east coast have to this day even succeeded in maintaining their political independence in a strip of territory extending from Cape Catoche to British Honduras. In the interior many of the whites have forgotten their mother-tongue, and even in the capital (Merida) Maya is universally spoken. Physically the Mayas are a fine race with thickset, bony frames, of mean height, light brown complexion, almost regular features, delicate hands and feet, round head, and remarkably intelligent expression. Their monuments are covered with inscriptions in a writing system, which was evidently greatly in advance of the Aztec, and which, although still undeciphered, seems to contain numerous purely

phonetic characters. The monuments themselves—such as the temples, palaces, pyramids of Palenque, Uxmal, Chichen-Itza—and the lately-discovered “Lorillard City,” present many curious architectural features, and are specially remarkable for their elaborate carvings, vast size, and massive character. Over sixty groups of ruins have already been surveyed, and many more undoubtedly lie still buried in the recesses of the forests, especially about the Guatemala and Chiapas frontiers. The great age formerly assigned to these ruins has not been confirmed by the observations of recent archaeologists, and it now seems probable that most of the structures cannot have been erected many centuries before the arrival of the Spaniards. (Stephens, Catherwood, Charnay.)

Mayenne, a department, river, and town in N.W. France. The department, lying to the E. of Ille-et-Vilaine, is 51 miles long by 39 miles broad, and contains 1,996 square miles. Geologically it is connected with Brittany. Besides the Mayenne with its tributaries, the chief rivers are the Vilaine, flowing into the Atlantic, and the Sélune, flowing into the English Channel. The department has a varied surface, and is well-wooded. The chief productions are cattle, poultry, butter, game, honey, and eider. Among the chief industries are coal-mining, quarrying, spinning, and weaving. The river Mayenne flows with a course of 127 miles through the three principal towns, and joins the Sarthe at Angers. Mayenne, the town, is capital of Mayenne, and is an old town built upon high ground overlooking the river. The only buildings of note are the ancient castle (now used as a prison), and a 12th-century church. Most of the inhabitants are employed in the cloth manufacture.

Mayer, JULIUS ROBERT VON (1814–78), German philosopher, was born at Heilbronn. He studied medicine at Tübingen, Munich, and Paris, and, after some experience as a ship's surgeon, he settled down to practise in Heilbronn in 1841. In 1842 he published *The Mechanical Theory of Heat*, and in 1848 advocated the meteoric origin of the sun's heat. His writings have been collected.

May Flies, a family of *Neuroptera* (q.v.), known as the *Ephemeroidea*. They differ from other members of this order by the absence or imperfect development of the hind wings. Their development is somewhat abnormal, as the pupa gives rise to a “subimago,” which flies about for some time and then moults; after this it is in the form of the fully-matured adult or imago. This introduction of an extra-developmental stage is known as hyper-metamorphism. The larva lives for two or three years, but the mouth of the adult or imago is so imperfectly developed that it cannot take food, and therefore can only live for a day. Owing to this, they are often known as “Dayflies.” The larvæ breathe by “tracheal gills.” *Ephemera vulgata* (Linn.), which is used by anglers under the name of the Brown or Green Drake, is the best-known English species.

Mayhew, AUGUSTUS (1826–75), English author, wrote alone, and in conjunction with his brother (q.v.). **HENRY** (1812–87) ran away from West-

minster school, and, after a voyage to India, was articled as a solicitor to his father. With Gilbert à Beckett he started the *Cerberus*, and, being thwarted in this, he ran away with Gilbert to Edinburgh. In 1831 he started *Figaro in London*, and he wrote much with his brother, the results appearing as the work of the brothers Mayhew. *London Labour and the London Poor* was long quoted as a standard authority. He was the first editor of *Punch*, at whose birth he assisted. **HORACE** (1816–72), a brother of both the above, was a contributor to, and for a time sub-editor of, *Punch*.

Maynooth, a small town in county Kildare, Ireland, about 15 miles N.W. of Dublin on the river Ryeewater. It contains the ruins of the castle of the Earls of Kildare and Carton, the modern residence of the Dukes of Leinster. Here in 1795 the Irish Parliament founded the Royal College of St. Patrick for the training of Roman Catholic priests. At the Union Government acknowledged its duty to this institution and passed an Act for its regulation, whilst in 1845 a grant of £30,000 for building and of £26,000 annually for maintenance was made by the Legislature. In 1871 the grant ceased in accordance with the Act for disestablishing the Irish Church, compensation being given. The building was seriously damaged by fire in 1878. It accommodates about 500 students.

Mayo, a county on the west coast of Ireland, in the province of Connaught, having the Atlantic to the N. and W., Sligo to the N.E., Roscommon to the E., and Galway to the S.E. and S. The area is about 2,060 square miles, the eastern portion of which is tolerably level, whilst the western half consists of granitic mountains, with a few fertile valleys running down to the sea. The Moy is the only important river, but there are many lakes, including Loughs Mask, Corrib, and Carrowmore. Fish abounds, and but for this the wretched peasantry could hardly subsist on their small holdings of poor soil. Except a little coarse linen and rough homespun, there are no manufactures; the quarries of limestone and slate employ but few hands. Iron ores and other mineral resources remain unavailable for want of fuel. It is divided into two single-member constituencies. Castlebar is the county town.

Mayo, RICHARD SOUTHWELL BOURKE, 6TH EARL OF, was born in 1822 and, after completing his education at Trinity College, Dublin, made a tour in Russia, a record of which he published in 1845. Two years later he entered Parliament, and sat in the Commons until his accession to the Lords in 1867. In each of the three Derby Administrations he served as Chief Secretary for Ireland, and was holding the same post under Mr. Disraeli, when in 1868 he was appointed Governor-General of India. Setting his face against annexation, he strove to win the confidence of feudatory princes and of independent neighbours, especially in the North-West. Meanwhile great internal reforms were carried out in finance, local government, irrigation, education, especially amongst the Mohammedans, legal codification, and gaol management. In 1872 he was killed by a fanatic at the Andaman Islands' convict settlement.

Mayor, the title of a chief magistrate, or of a chief officer, derived through the French *maire*, from the Latin *maior*, "greater," "elder" (whence also "major"). In England and Ireland the chief magistrate and head of the municipal council in a city or borough has the title of mayor, the chief magistrates of London, Dublin, York, and (since 1893) of Belfast, Leeds, Liverpool, and Manchester being styled Lord Mayor. For *Mayor of the Palace* see CHARLES MARTEL, PEPIN.

Mazanderan, a province of Persia, 220 miles long by 60 miles broad, and occupying an area of about 10,000 square miles, between the Caspian Sea, the Elburz range, and the provinces of Astrabad and Gilan. The N. portion, near the Caspian shores, is level, being partly under cultivation for rice, sugar, and cotton, partly covered with jungle. Towards the S. the land rises rather suddenly to join the spurs of the Elburz, and the peak of Damavand attains a height of 18,600 feet. The climate is unhealthy, though the upper plateaus are fairly salubrious. The province is rich in minerals and petroleum, and, besides the products above-named, yields oranges, lemons, silk, and caviare for exportation, Baku being the nearest trading centre. It is administered by a governor, and the inhabitants, though reputed dull and rough, are by no means turbulent.

Mazarin, JULES, or GIULIO MAZZARINI, Cardinal and Minister of France, was born in 1602. He became in 1634 Vice-Legate at Avignon, whence he was transferred to Paris. Richelieu induced him to change his nationality, and procured his elevation to the rank of cardinal. Louis XIII. in his will named him as a member of the Council of Regency (1643), and Anne of Austria, the Regent, delegated to him almost absolute power. The victories of Rocroy, Nordlingen, and Lens, followed by the Peace of Westphalia, conferred great prestige on him; but in 1648 the combination of discontented noblemen known as La Fronde (q.v.) broke out into civil war. It was not until 1653 that he finally gained the advantage over his opponents, and during the next eight years he paved the way by his policy for the glorious epoch of Louis XIV., the Peace of the Pyrenees, concluded with Spain 1659, being one of his most important achievements. He died in 1661.

Mazeppa, a Cossack hetman or prince, was born in Podolia about 1640. He entered the service of a Polish lord, who, suspecting him of an intrigue with his wife, had him bound to the back of a wild horse. The animal carried him into the Ukraine, where he was released by some peasants, settled amongst them, and rose in 1687 to be hetman. Peter the Great conferred on him the title of Prince, but he betrayed his benefactor, and fought against him under Charles XII. of Sweden. When the latter was defeated at Pultawa, Mazeppa fled, and died at Bender in 1709. He owes his fame chiefly to the well-known poem in which Byron describes his involuntary and perhaps apocryphal ride.

Mazzini, GIUSEPPE, the son of a Genoese physician, was born in 1808. He graduated at the

university of his native town, and plunged eagerly into the patriotic movement, joining the Carbonari, but soon becoming disgusted with the unpractical methods of that secret society. In 1830 he was arrested by the Sardinian Government and thrown into the fortress of Savona. Here he matured his plan for the formation of a new party, *La Giovine Italia* ("Young Italy"), which should have for its object the liberation of the country from foreign and domestic tyranny, the establishment of a republic, and the proclamation of the rights and duties of man. On his release he began action at once by addressing from Marseilles a letter to Charles Albert, who, however, banished him from his dominions. Later on Louis Philippe expelled him from France. He now settled at Geneva, where he edited *L'Europe Centrale* and organised an expedition under General Ramorino to rescue Savoy, taking part himself in that wretched fiasco, and being condemned to death in his absence. In 1837, banished from Switzerland, he arrived in London, whence he directed the efforts of his disciples, and published his treatise on *The Duties of Man*. An intercepted letter of his in 1844 led to the detection of the Bandiera conspiracy and the execution of its unhappy authors. In 1848 he joined Garibaldi in the war against Austria. He was a member of the Provisional Government of Tuscany, and of the Roman Triumvirate in 1849, but had to yield to French arms, and return once more to England. As president of the National Italian Committee he promoted the insurrections of 1852-53, and the Genoese rising of 1857, for which he was a second time sentenced to death. The successful policy of Cavour proved fatal to his aspirations, and the unification of Italy was effected without his aid. He refused to sit in the Italian Parliament, or to accept his pardon at the hands of the king, but was permitted to reside in Italy, and died at Pisa in 1872.

Mead, a strong alcoholic beverage made by adding a ferment such as yeast to a mixture of honey and water with flavouring. The name used to be applied to other strong liquors. A kind of mead made in water was called metheglin.

Meadow-sweet (*Spiraea Ulmaria*), a beautiful British plant belonging to the rose tribe. It grows abundantly in wet places, reaching a height of several feet. Its stems are tinged with red; its leaves, pinnate with a large terminal lobe, a serrate margin, and rather a dark green colour; and its small cream-coloured and fragrant flowers, crowded in a dense and elegantly-branched terminal cluster, technically known as an *anthela*.

Meagher, THOMAS FRANCIS (Meagher of the Sword), was born in 1823 at Waterford, Ireland. Joining the Young Ireland party in 1845, he denounced O'Connell's pacific policy, and attached himself to Smith O'Brien and John Mitchel, the founder of the *United Irishman*. All three were arrested, tried for seditious writing and speaking, and acquitted. Mitchel, however, was subsequently transported under a special Act, and his two friends openly took up arms with their supporters, "the Confederates." Then followed the

absurd affair at Ballingarry (1848), soon after which Meagher was caught, convicted, sentenced to death, and ultimately sent to Van Diemen's Land. He escaped in 1852, and went to New York. In the civil war he sided with the North, raised the Irish Brigade, fought at Bull's Run and Fair Oaks, and received several good posts. From 1865 to 1867 he acted as Governor of Montana, in spite of Republican opposition. He was accidentally drowned in the Missouri at Fort Benton.

Meal-worm, the larva of a moth known as *Pyralis farinalis* (Linn.). It is very common in meal and used as food for cage-birds. The species is of interest as the type of the Pyrales, one of the groups of Microlepidoptera.

Mean, in mathematics, is a sum of a series which comes between two other sums and bears a certain relation to them. The arithmetic mean of two numbers is half their sum, the geometric mean is the square root of their product, and the harmonic mean is twice the product of the two numbers divided by their sum. Between two given numbers it is possible to insert any number of terms such that they form a series in arithmetical, geometrical, or harmonical progression. The terms so inserted are also called *means*.

Measles (*Morbilli*), an infectious disease characterised by a peculiar skin eruption with associated affection of the mucous membrane of the respiratory tract. Measles is exceedingly infectious, and is capable of transmission from person to person at a very early stage, indeed before the precise nature of the malady is definitely declared by the appearance of the characteristic symptoms. It thus happens that most people are affected by the disease in early childhood, and the individuals so attacked appear to acquire "protection" against subsequent attacks. Measles is therefore uncommon in adults, though in some exceptional instances a second or third attack of the disease has been known to occur in the same individual. After exposure to infection, a period of incubation ensues of from 12 to 14 days' duration. After the lapse of this time a person who is susceptible and unprotected becomes feverish and suffers from headache; there is watering of the eyes, sneezing, and sometimes hoarseness and cough. On the fourth day after invasion the fever increases and the characteristic eruption develops. It usually appears first on the forehead, and then travels downwards, involving the whole surface of the body, but particularly affecting the back. The rash attains its full development in two or three days, and then gradually disappears, leaving behind it, as a rule, some degree of bran-like desquamation. When the rash begins to fade the temperature usually suddenly declines, and, in the absence of complications, convalescence soon becomes established. The rash is slightly elevated above the surface of the skin. It is of a dusky pink colour, and the papules of which it consists are often arranged in a crescentic manner. It is liable to be confounded by the uninitiated with the eruption of scarlet fever, and in some instances small-pox in its early stages has been mistaken for measles. Certain

complications are apt to supervene upon an attack of measles, particularly laryngitis, bronchitis, and pneumonia, while purulent ophthalmia and suppuration of the middle ear are not uncommon. Treatment consists in keeping the patient in bed in a well-ventilated room, protecting him from draughts, and feeding him during the febrile stage upon an ordinary sick diet. When convalescence is established tonics may be administered, and a more substantial diet adopted. Should complications appear, they would require special treatment. In order to prevent the spread of the disease the patient should be absolutely confined to his room during convalescence, and should not be allowed to associate with other children for at least three weeks, and then only if all desquamation and cough have ceased. The sick chamber and clothes, bedding, etc., must, of course, be properly disinfected.

German measles (*rötheln*) is an infectious disease, closely resembling, and often confounded with, measles. The period of incubation is probably shorter than in measles, the initial febrile stage is shorter than in that malady, and the cold in the head is absent or is a less marked phenomenon. Sore throat is, on the other hand, usually complained of, and it is said that in *rötheln* there is a tendency to the enlargement of the lymphatic glands. The disease is, on the whole, milder than measles, and is rarely attended by complications. Measles and *rötheln* are not mutually protective.

Measured Mile, a measured sea-course of one mile (knot), whereon ships may steam their trial trips. There is usually one in the vicinity of every great naval port. Steam-ships tried on the measured mile are generally provided with selected coal and picked stokers, and are, moreover, clean. They do not commonly, therefore, ever subsequently do as well again.

Meath, a county on the E. coast of Ireland, in the province of Leinster, bounded on the E. by the Irish Sea, S.E. by Dublin, S. by Kildare and King's County, W. by Westmeath, N.W. by Cavan and Monaghan, N.E. by Louth. It has an area of 904 square miles, most of which consists of slightly undulating land, with a deep rich deposit of loam resting on a subsoil of limestone. The picturesque river Boyne flows from S.W. to N.E., and divides the county into two nearly equal parts. Except the Bog of Allen, nearly the whole is under cultivation, and upwards of ninety per cent. of the land is arable, yielding, as a rule, excellent crops. Except a few linen and woollen fabrics, there are no industries save agriculture, and the ten miles of coast do not support many fishermen. Trim is the chief town. The county sends two members to Parliament, and gives its name to a bishopric.

Mecca (Arab. *Makka*), the birthplace of Mohammed, and the religious centre of the Moslem world, is a city about 45 miles due E. from Jidda on the Red Sea, and is the capital of Hijaz, a province of Arabia. The houses are fairly built, and the streets tolerably wide; but the cramped position of the city in a deep valley, the utter want of drainage, and the overcrowding at the holy

season, give occasion to fearful epidemics, whilst in the rainy weather floods are a constant source of danger. The Great Mosque (Beit Allah) occupies a level site about the middle of the city, and encloses within a rectangular cloistered court the famous Kaaba (q.v.). The great pilgrimage of the year takes place in June and July, when as many as 100,000 *hajis* often assemble. Burckhardt, Burton, and Von Maltzahn are among the few unbelievers who have visited the holy places.

Mechanics, the name generally given to the science of force, is more properly confined to the study of forces on machinery (*mechanē*, a machine). It involves primarily kinematics, the science of motion, and in many cases the consideration of the acting forces is much less important. The simple machines investigated in elementary dynamics, otherwise termed the *mechanical powers*, are the lever, the wheel and axle, the three different systems of pulleys, the inclined plane, the screw, and the wedge. The two first are in principle identical, as also the three last. The hydraulic press constitutes another such simple machine, but it depends for its action on the characteristic property of a liquid (q.v.). [DYNAMICS.]

Mecklenburg, a district of north Germany upon the Baltic Sea, which was occupied in the 7th century by a Vandal race, whose Slavonic blood is still perpetuated in the ruling families. In 1160 it was annexed by Saxony, and later on passed under Danish supremacy, but was soon restored. Divisions began in 1229, and went on for centuries, resulting in the final partition (1701) into Mecklenburg-Schwerin and Mecklenburg-Strelitz, the latter having previously been called Mecklenburg-Güstrow. Mecklenburg-Schwerin lies W. of Mecklenburg-Strelitz and Pomerania, E. of Ratzeburg and Lauenburg, N. of Brandenburg and Hanover, and has an area of 5,117 square miles and a considerable coastline. It comprises the duchies of Schwerin and Güstrow, the district of Rostock, the principality of Schwerin, the barony of Wismar, and other minor constituents. The government is in the hands of a Grand Duke, under a constitution which retains much primitive feudalism; but for military purposes both duchies are absolutely subordinate to the Imperial Government, and a contribution of about £100,000 annually is made to the Berlin exchequer. The flat, alluvial soil is fairly productive, the rivers and canals afford easy carriage, the coast and lakes supply abundance of fish, and the shipping interest grows stronger year by year. Industries such as wool-spinning, brewing, tanning, distilling, and cigar-making flourish, whilst mines exist here and there, and the amber gathered on the shore is a valuable export. Mecklenburg-Strelitz consists of two distinct portions, viz. the duchy of Strelitz, lying E. of Mecklenburg-Schwerin, and the principality of Ratzeburg to the W. The total area is 1,126 square miles. The Grand Duke is closely connected by family ties with the ruler of Mecklenburg-Schwerin, and both duchies have a common Landes-Union or Parliament, and a common judicial organisation. They are in other respects distinct.

Medals, metal discs, stamped with some device,

struck to commemorate some event or given for distinction gained in the naval or military service, for heroism or for other merit. In the navy and army medals were, until the 19th century, seldom given to any save officers; but after the accession of Queen Victoria medals were awarded to men of all ranks who had been engaged in certain previous campaigns and actions. These were of silver. For over two hundred actions the same medal was granted, with a distinctive variation in the form of a bar or clasp to be worn upon the ribbon above the decoration. Since the first general introduction of the practice of giving medals to all ranks, the system has been continued in the British services. The term medal also includes any sort of metal disc struck to commemorate a special event or individual. Medals for life-saving are given by the Royal Humane Society, the Royal National Institution, the Board of Trade, the Tayleur Fund, Lloyd's, the Marine Society, etc. After the battle of the Nile Mr. Davison, Lord Nelson's prize-agent, gave, at his own expense, medals in gold, silver, bronze-gilt, or bronze to those who had been engaged. Mr. Boulton acted similarly after Trafalgar, and after St. Vincent Lord St. Vincent gave medals to the people of his flagship. Before the 16th century medals were generally cast or engraved. Among the great medallists may be mentioned Thomas Simon in the time of Cromwell and Charles II.; Pistrucci, who designed the coins of George IV.; D. F. Loos, who died in 1819; G. B. Loos, who died in 1843; and W. Wyon, who died in 1851. Queen Victoria's Jubilee medal (1887), which was given to her Majesty's Household, to the police, etc., was designed by Sir E. Boehm and Sir F. Leighton. The Albert Medal, granted by her Majesty for saving life, was instituted in 1866, divided into two classes in 1867, and made to include gallantry ashore as well as at sea in 1877.

Medea, according to Greek legend, was the daughter of Æetes, King of Colchis, and the niece of Circe, whose magic arts she inherited. Jason, coming to Colchis in search of the Golden Fleece, won her love, and she not only helped him to defeat the wiles of her father, but fled with him later to Greece, slaying her own brother and strewing his limbs in the way to stay pursuit. On reaching Iolchos, Jason found that his father and brother had been murdered by Pelias, who at Medea's suggestion was killed and boiled by his daughters with the idea of restoring him to youth. Driven out of their home, she went with her husband to Corinth, where Jason became enamoured of the king's daughter Glauce, whom Medea destroyed, murdering at the same time her own children. She then betook herself to Athens, and married Ægeus, to whom she bore Medus. For an attempt to poison Theseus she was again exiled, and is said to have returned to Colchis and become reconciled to Jason. Her tragic story has been dramatised by Euripides, Seneca, and Corneille.

Medellin (classic *Metellinum*). 1. A town of Spain on the left bank of the Guadiana about 35 miles E. of Badajoz. It was founded by Quintus Cecilius Metellus, and is still rich in Roman remains.

Here Fernando Cortez was born, and here in 1809 Marshal Victor defeated the Spaniards.

2. The name is also borne by a city of some importance in the Confederation of Grenada, South America, on the flanks of the Andes 50 miles S.E. of Antioquia. It is a mart for local produce, especially coffee.

Media, a province of the Assyrian empire, which revolted towards the end of the 8th century B.C., and enjoyed independence for about a hundred and fifty years, when it was annexed to Persia by Cyrus. Media comprised, perhaps, the districts now known as Azerbaijan, Ghilan, Mazanderan, Irakajemi, and the northern half of Laristan. [PERSIA.]

Medical Jurisprudence. Forensic medicine is the "science which teaches the application of every branch of medical knowledge to the purposes of the law." It deals with the signs of death, with the post-mortem appearances in the case of sudden death, and with insanity, poisoning, birth, infanticide, etc., in their legal relationships. For *poisoning* see the article on that subject.

Medici, the name of a family that has played a great part in Italian history. COSIMO, or COSMO, DEI MEDICI ("The Elder") was born in 1389, and succeeded his father as gonfalonier in 1429. He formed alliances with Francesco Sforza, the Venetians, and the Pope, advanced the commercial prosperity of Florence, and was a liberal protector of art and learning. The Academy and Laurentian Library were founded by him, and he afforded hospitality to many Greek refugees. By his generous support of the poor during a famine he won the title of *Pater Patriæ*, and died in 1464. LORENZO ("The Magnificent"), grandson of the above, was born in 1449, and succeeded his father, Pietro, in 1469, nominally sharing power with his brother Giuliano. The Pazzi were now the opposing faction, and, abetted by Pope Sixtus IV. and Archbishop Salviati, they endeavoured to assassinate the brothers in 1478, but only the younger perished. Lorenzo now had a free hand. He put most of his adversaries to death, alienated Naples from the Pope and so brought the latter to terms, and altered the constitution of Florence so as to make the *balia* or elective council permanent and so secure his continuance in power. Though tyrannical, immoral, and careless in finance, he raised Florence to a high state of prosperity, and directed its foreign policy with no little skill, aiming particularly at creating unity of interests between the republic and the Papacy. His patronage of literature and art was constant and generous. Pulci, Ficino, Poliziano, Pico della Mirandola, and the youthful Michelangelo found a home at his court, and he himself wrote poetry of no slight merit. At his death in 1492 he was succeeded for a couple of years by PIETRO II., his eldest son. [LEO X., CLEMENT VII., CATHARINE DE MEDICI, MARIE DE MEDICI.]

Medicine. Indications of the medical knowledge of the ancients may be traced back many hundred years before the Christian era in Egyptian,

Indian, and Chinese writings and in the Homeric poems. The first approach, however, to anything corresponding to modern medical knowledge is met with in the 5th century before Christ in the writings of Hippocrates (q.v.), and these are so markedly in advance of anything dealing with the same subject-matter that had appeared up to that time, that their author has universally been accorded the title of the "Father of Medicine." Hippocrates founded his system mainly on a close study of the symptoms of disease; of anatomy and physiology he knew little, and the pathology of his time was necessarily very crude. He maintained that health was dependent upon the due admixture in the body of the *four humours*—blood, phlegm, black bile, and yellow bile—and thus originated the doctrine of humorism, which, with the subsequently enunciated doctrine of solidism, formed the basis of much discussion in later days. Hippocrates was a believer in the healing power of nature, and he devoted much attention to the art of prognosis, in which he attained great skill. His famous doctrine of "critical days" was, however, undoubtedly far-fetched, and undue importance was attached to it both by him and by his successors; he also carefully investigated the question of diet. The study of the writings of Hippocrates and the further development of the science of medicine were taken up by many schools, the most famous of which was that of Alexandria, and in this city anatomical investigation was for the first time systematically prosecuted.

With the establishment of the Roman supremacy, Rome became the great centre of medical science, and the state of knowledge in the 1st century A.D. is depicted in the treatise on medicine written by A. Cornelius Celsus. The most famous of the Roman physicians, Galen (q.v.), lived in the second century after Christ. His system was modelled upon that of Hippocrates, and he devoted special attention to the development of knowledge in connection with anatomy, physiology, and the use of drugs. The writings of Aretæus of Cappadocia, who appears to have lived at about the same time as Galen, have acquired considerable celebrity.

The Arabian writers next demand attention; though of much later date, their works present no great advance on the writings of the early centuries of the Christian era. They introduced many new drugs, and mention is for the first time made by them of small-pox and measles. Rhazes, who lived in the 10th century, and his successors, Avicenna and Averrhoës (q.v.), were the greatest of the Arabian writers, and their works were largely read in Europe in a Latin dress, particularly in the great schools of Salerno, Montpellier, and Bologna.

With the revival of learning, the ancient Greek and Roman writings again began to be read in their original form, and men were no longer content to study the writings of the ancients through the medium of their Arabian interpreters. There also arose at this time the system of chemical medicine which is associated with the name of Paracelsus, who lived in Germany in the 16th century. Moreover, certain great epidemics stimulated medical study in the 15th and

the 16th centuries, and syphilis made its appearance in Europe.

In the 17th century came Harvey's (q.v.) great discovery of the circulation of the blood, and the commencement of the application of physical and chemical knowledge to medical science. The Spanish bark was discovered, the plague made its appearance, and in the later years of the century lived the famous Sydenham. This author, who is often called the English Hippocrates, directed attention to the importance of studying the phenomena of disease apart from preconceived theories as to the nature of morbid processes. He invented the celebrated phrase, "epidemic constitution," and minutely described the epidemic diseases prevalent in London during a series of years. He was a great advocate of bleeding, but introduced many improvements in methods of treatment.

During the 18th century flourished the great teachers Boerhaave, Stahl, and Haller, the works of Morgagni on anatomy and of Cullen on medicine appeared, and the treatises of Fothergill on the putrid sore-throat, of Huxham on epidemic fevers, and the commentaries of Heberden were written. At the end of the century came the momentous discovery of vaccination by Jenner. Avenbrugger's work on percussion appeared in 1761, but it was not popularised until it was translated many years later by Corvisart. The method of physical diagnosis was completed by Laennec, who invented auscultation.

Some of the chief additions to knowledge made in the first half of the 19th century have been those of Bretonneau, who described diphtheria; of Trousseau; of Richard Bright, who gives his name to Bright's disease; and of Addison, who gives his name to Addison's disease; while Graves and Stokes of Dublin should also be mentioned. In Germany Skoda developed the work of Laennec, and Rokitansky elaborated the science of pathology.

In 1821 Sir Charles Bell demonstrated the function of the anterior and posterior roots of the spinal cord, and then followed a steady advance in the knowledge of the pathology of the nervous system, which resulted in more recent years in the unravelling of the mysteries of diseases of the spinal cord by Duchenne and by Charcot. The year 1849 is remarkable for the announcement by Dr. Snow of the possibility of the conveyance of the infection of cholera by drinking water, and for the demonstration by Sir William Jenner of the difference between typhoid and typhus fevers.

The great discovery of the anæsthetic influence of ether was made shortly before the middle of the century, and soon afterwards followed the demonstration of the utility of the clinical thermometer, and then subsequently the discovery of the laryngoscope and ophthalmoscope. The advances of recent years have been made on two great lines of new departure. In the first place, there has been the growth of preventive medicine, or sanitary science, with resulting diminution of the mortality from preventable disease and the material reduction thereby effected in the general death-rate; and, secondly, the growth of the germ theory of disease, which has profoundly modified medical science and treatment. Davaine's discovery of the bacillus of

anthrax, Pasteur's brilliant researches, and in recent times the wonderful discoveries of Koch, may be noted as conspicuous instances of the work which has been, and is being, done in this branch of knowledge, and which has already so greatly modified, and is probably destined still further to modify, the practice of medicine.

Medina, or EL-MEDINA ("the City"), sacred to Mussulmans as the place to which Mohammed fled from Mecca, and in which he lies buried, occupies a hollow in a plateau forming part of the range that flanks Arabia on the W. It is in the Hijaz, about 250 miles N. of Mecca. Strong walls, with handsome gates, surround the city proper, which is well built, clean, and supplied with abundant water. The Mosque of the Prophet (El Haran) is in the eastern quarter, and contains the grave of Mohammed, with those of Abubekr and Omar on either side, and that of Fatima close at hand. The hut of Ayesha, in which the teacher died, is supposed to have stood on this spot, and it was outside the original mosque in which he preached. The present building is the result of many additions.

Mediterranean Sea, THE, is the mass of water which separates Europe from Africa, and in its eastern part washes a comparatively small strip of the coast of Asia. Its length from Gibraltar to Syria is 2,100 miles, and its breadth varies from 500 to 250 miles. Excluding the Black Sea and the Sea of Azov, the area may be reckoned at about a million square miles. At the N.E. corner of the Ægean Sea, which forms its outmost limb, a narrow passage, the Dardanelles, leads through the Sea of Marmora and the Bosphorus to the Euxine or Black Sea and the Sea of Azov beyond. Its tides are trifling, and, owing to evaporation and impeded circulation, the water of the Mediterranean is far saltier and heavier than that of most other less confined seas. The current in the straits of Gibraltar always flows west on the surface, and it was long a mystery how the volume of the inland sea was kept constant, until recent observations showed the existence of a submarine inflow which more than compensates for the outflow. As a whole, the Mediterranean is a shallow sea. Between Malta and Crete, and between Naples and Sardinia, it attains 2,000 fathoms, or a little more; but towards the W. the bottom shelves up to 300 or 400 fathoms, and between Tunis and Sicily a ridge extends at a depth of 200 fathoms. The mean temperature at 100 or 150 fathoms is 54° to 56° Fahr.

Medlar (*Mespilus germanica*), the only European species of a genus of Rosaceæ, sometimes reckoned only a sub-genus of *Pyrus*, is a small much-branched tree, native to western Asia and central and southern Europe, and has been long known as a fruit-tree. When wild it is spinous, and its twigs branch at right angles. The leaves are oval, lanceolate, and larger in the cultivated forms. The white flowers are solitary and terminal, and the globular fruit becomes brown, and has the withered leafy lobes of the calyx projecting from the upper edge of the five distinct carpels, or stony divisions of the core, which are not enclosed by the receptacular tube as in an

apple. [POME.] The flesh is at first hard and uncatable, but undergoes a change, called *bletting*, by which it becomes soft, sub-acid, and edible.

Médoc (Lat. *Medulicus Pagus*), a district of the Bordelais, France, forming a sort of peninsula between the river Gironde and the ocean, and comprised within the department of the Gironde. The area is about 386 square miles, most of it being bare, rocky, slightly undulating, and sparsely watered. The soil, however, is admirably suited to the wine-grape, and here the finest quality of Bordeaux is produced. The whole country is divided into vineyards, each of which has its characteristics, though the produce of certain neighbourhoods is known by a generic name, such as Grave, Pauillae, etc. Château Margaux, Château Lafitte, and Château Latour are amongst the most celebrated growths. Within the last twenty years the phylloxera has played havoc with the vines of Médoc, which used to yield 40,000 tuns, but they are now recovering.

Medulla. [PITH.]

Medusæ, the young of many forms of Hydrozoa (q.v.). They are bell-shaped organisms consisting of a hemispherical fleshy disc, from the centre of which hangs a soft tube, and the mouth opens at the free end of this, and leads to a large cavity, the atrium, from which radiate a number of gastric canals.

Medway, a river of England which, rising, partly in Surrey and partly in Sussex, flows N.E., chiefly through Kent, for a distance of 58 miles till it joins the Thames near Sheerness by an estuary 12 miles in length. Tunbridge, Rochester, and Maidstone are upon its banks, and it is navigable for vessels of some size as far as the latter town, whilst boats and barges can ascend to Penshurst.

Meerschäum (sea foam), a creamy-white and very light hydrous silicate of magnesium ($Mg_2Si_2O_8 + 2H_2O$), derived, no doubt, from the decomposition of some anhydrous, rock-forming magnesian silicate, and occurring in nodular masses, which have occasionally been found floating on the Black Sea. It is opaque and earthy; has a hardness between 2 and 2.5, and a specific gravity between .99 and 1.28; breaks sometimes with a conchoidal fracture, and adheres to the tongue. It is mainly obtained in Asia Minor, from 8,000 to 10,000 cases, of from $\frac{3}{4}$ to 1 cwt. each, being yearly shipped from Smyrna for Vienna. Owing to its porosity it is used almost exclusively for tobacco pipes; but half the so-called meerschäum pipes are imitations, made either of plaster of Paris and paraffin or, it is said, of potato.

Meerut, or MIRATH, a division, district, and capital city in the North-West Province of British India. The former includes six districts, viz. Dehra Doon, Saharanpur, Muzaffarnagar, Meerut, Bulandshahr, and Aligarh, and has an area of 11,138 square miles, forming part of the Doab. The district lies to the W. of the Ganges and the E. of the Jumna, having Muzaffarnagar and Bulandshahr to the N. and S. respectively. It consists of a narrow plain about 2,361 square miles in extent, with a slight slope from N. to S. With the exception of some small patches

of jungle or sand, the whole is carefully irrigated and cultivated, and yields immense crops of grain, cotton, and indigo. The chief modern centres are Meerut, Ghaziabad, and Mawana. Sindhia ceded the territory to the British in 1803. The East Indian and the Punjab and Delhi railways together with numerous canals afford abundant means of intercommunication. Meerut, the capital, standing half-way between the Jumna and Ganges, is an ancient town, but owes its present importance entirely to the large cantonment which lies S. of the poor and uninteresting settlement and accommodates a whole division. It was here that the Mutiny broke out in 1857. The climate is fairly healthy, the European quarter is well laid out, and there are many useful and benevolent institutions.

Megalithic, a term applied to monuments, probably sepulchral, consisting of huge unhewn stones—dolmens, circles, avenues, and menhirs. It is opposed to *Microlithic*, which is applied to monuments in which small squares or hewn stones were used.

Megalosaurus, a huge reptile, the type of a family Megalosauridæ, in the carnivorous order Theropoda of the sub-class Dinosauria (q.v.), which occurs in Oolitic and Wealden deposits in England. *M. Bucklandi*, from the Stonesfield Slate (Bathonian) is estimated to have been 25 feet long and to have weighed two or three tons. It had only four toes to each foot, and, like many carnivorous mammals, was digitigrade, with prehensile claws. Its fore-limbs are very small and limb-bones hollow; but both its thigh-bone and leg-bone are three feet in length; so that it probably walked erect. It has trenchant, curved, pointed, and finely serrated teeth, and fed probably on the molluscs, fish, and small rat-kangaroos on the shores of the lagoons by which it lived.

Megapodes. [MOUND-BIRDS.]

Megarís, the name of the district surrounding the town of Megara, and comprising about 143 square miles of the broader part of the Isthmus of Corinth. It is traversed by the range of Geraneia, and the only plain it possesses is the White Plain, upon which Megara stood. This town attained great power in the 8th century B.C. Constitutional troubles ensued and weakened the state, which could not resist the growing influence of Athens. Megara allied herself with Athens in the struggle against Sparta, but changed sides, and suffered terribly. In the Roman period the place still flourished, but afterwards decayed. Theognis, Susarion, and Enclid (the philosopher, not the more famous geometriean) were amongst its greatest citizens.

Megatherium, a gigantic representative of the Edentata (q.v.), found fossil in Pleistocene rocks in America. The best known species, *M. americanum*, had a body 13 feet long, which was equal in bulk to that of the elephant, but with shorter limbs and with a powerful tail 5 feet long. The skull and teeth resemble those of the sloths; the rest of the body that of the ant-eaters. The first digit of the hand and two of the toes were aborted, and three fingers of each hand and one toe of each foot have

enormous claws. The fore-limbs are longer than the hind ones, and the heel in the latter projects almost as far backwards as the foot does forward. The animal undoubtedly fed upon leaves, sitting up and clawing them down. Complete skeletons from Buenos Ayres are in the Natural History Museum and in that of the College of Surgeons, and smaller species have been found in Brazil, Georgia, and South Carolina.

Megrim (MIGRAINE, HEMICRANIA) is a form of headache, which usually recurs at tolerably definite intervals, and which sometimes is limited to one half of the head. This disease is eminently hereditary, and usually occurs in families which have a history of nervous complaints. It commences, as a rule, in early childhood, and the attacks diminish in intensity after middle life. In addition to the pain in the head, there is sometimes vomiting and dimness of sight. A peculiar symptom which is occasionally present is *hemiopia*—that is to say, there is a temporary dimness of vision as far as one half of the visual field is concerned. The outer boundary of the dim area is sometimes limited by an outline, which has been described as resembling that of a fortification. An attack of megrim usually lasts for eight or ten hours; it may be brought on by errors in diet, over-fatigue, or by breathing a polluted atmosphere. As regards treatment, careful attention to diet and the use of tonics are indicated. During the attack bromides, antipyrin, and caffeine have, in some instances, been found to give relief.

Megrims is also a term applied to a disease affecting the horse, in which the animal is subject to giddiness or to attacks of insensibility.

Meiningen, the capital of Saxe-Meiningen, and the judicial centre of that duchy as well as of Saxe-Coburg and the districts of Schmalkalden and Schleusingen, is situated on the Werra, 40 miles S. of Eisenach. The old town must have been founded about ten centuries ago, for the parish church dates from 1003. The bishops of Würzburg were supreme here till 1542, and the dukes of Saxony held it for about 100 years, when it passed to Saxe-Altenburg, being assigned to Saxe-Meiningen in 1680. Around the ancient portion pleasant suburbs have sprung up, with a fine park, a new palace, and other handsome buildings. The Elisabethenburg, where the dukes formerly resided (1682), is now a museum. The theatre, under the patronage of successive rulers, has become famous throughout Europe.

Meissen, an ancient centre of industry, stands on the left bank of the Elbe in Saxony, about nine miles N.W. of Dresden. Founded in 928, it became the seat of a powerful line of margraves, from whom the dukes and kings of Saxony descend. Until 1581 the prince-bishops of Meissen were most important personages. The cathedral, completed about 1400 (with the exception of the tower, which dates from the 15th century), is a noble specimen of early Gothic. The Schloss, begun in 1473, has been restored and redecorated with modern frescoes. Across the river, spanned by a 13th-century bridge,

is the Fürstenschule, where Lessing and Gellert were educated, occupying the site of the former convent of St. Afra. The town-hall, the Frauenkirche, and many other remarkable buildings adorn the quaint and hilly streets. Meissen contains the famous factory where Dresden china is made, and has also iron-works, breweries, sugar-refineries and other industrial establishments, besides doing a large trade in the wine of the district.

Meissonnier, JEAN LOUIS ERNEST, was born in 1815, but was early taken to Paris, where he studied art under Potier and Cogniet. He exhibited as a youth water-colour and oil-paintings at the Salon, where *The Chess-players* attracted some notice in 1836; and he soon started that series of minutely-finished and faithful studies from French history, especially in its military aspects, upon which his fame chiefly rests. *Napoleon I., Campaign de France, 1814, Cuirassiers, 1805, Friedland*, and *Solferino* are among his most famous efforts. Of his genre pictures *La Rixe, La Lecture chez Diderot, La Lecture du Manuscrit*, and *Les Amateurs de la Peinture* deserve special mention. The Grand Cross of the Legion of Honour, the membership of the Institute, and the honorary title of Royal Academician were conferred on him in his later years. He died in 1891.

Mekong (Chin. *Lan-tsang-Kiang*; Tibet. *Dukio*), a river in farther Asia, which takes its rise near Chiamdo, in Tibet, flows S. through the peninsula of Siam, and, after a course of about 2,800 miles, discharges itself into the China Sea in Cochin China or Cambodia. It carries down vast quantities of silt, and the delta of Cochin China, through which it makes its way in several channels, is formed of its alluvium. The river has acquired some notoriety since 1892, as the French claim it to be the eastern boundary of Siam. The current is extremely languid near the mouth, but rapids and shoals soon check navigation higher up. Serious floods occur in the rainy season, and are swelled towards the mouth by the Semun, Udong, Attopen, Sekong, and other affluents.

Melæna, the term applied to the condition in which altered blood appears in the stools. If bleeding occurs into the alimentary canal, the action of the digestive juices upon the blood is such that its red colour is lost, and a black appearance is produced in the discharges which are passed *per anum*. The word melæna, which is derived from a Greek word signifying "black," is hence appropriately applied to the condition. Melæna may be due to hyperæmia, ulceration, or new growth affecting the stomach or intestines. It occurs in malaria, purpura, and scurvy, and supervenes in cases of obstruction to the portal circulation due to liver disease or to other causes.

Melancholia. [INSANITY.]

Melanchthon, PHILIP, whose real surname, SCHWARZERD, was Græcised by the pedantry of his age, was born in 1497. After finishing his studies at Tübingen under Reuchlin, he began to lecture publicly on the classics. In 1518 he was appointed to the chair of Greek at Wittenberg,

where he assisted Luther in translating the Bible, and soon adopted his theological views. He filled Luther's place during his confinement in the Wartburg (1521), having previously published his first treatise in support of the authority of the Scriptures as against that of the Fathers. In 1526 he was appointed as one of the commissioners, in accordance with the result of the Diet of Spires, to visit the reformed communities. At the Marburg Conference he argued with Zwingli on the doctrine of the real presence, and next year (1530) he drew up the Augsburg Confession. He was not averse to a compromise with Rome, whose errors he regarded as outgrowths rather than wilful impostures; and this spirit, which showed itself in the reservations with which he signed the Smalkalden Articles, comes out more clearly after Luther's death. His attitude towards the overtures for reconciliation made in 1547, led to the adiaphorist controversy as to what matters were or were not indifferent to the faith. His later years were somewhat marred by bitter and profitless disputes not only with Romanists, but with reformers also. He died in 1560, and was buried beside Luther in Wittenberg church. His two chief works are entitled *Loci Communes Rerum Theologicarum*, *Libellus Visitatorius*, and *An Apology for the Augsburg Conference*.

Melaneseans ("Black Islanders"), a main division of the Polynesian peoples, who constitute the dark element in the Pacific Ocean, where they are in almost exclusive possession of the Solomon, Santa Cruz, New Hebrides, Loyalty, and New Caledonian groups, from them collectively called *Melanesia*. They also form the substratum of the population in the western parts of Fiji, and have left traces of their presence in New Zealand, the Marquesas, and other eastern archipelagoes, all of which were occupied by the black race before the arrival of their present brown Indonesian inhabitants. The Melaneseans, who number about half a million altogether, do not differ essentially from the aborigines of New Guinea and of the neighbouring islands in the eastern parts of the Malay archipelago, forming with them the Oceanic section of the Negro race collectively classed as Papuans. [PAPUANS.] Physically they differ altogether from the Eastern Polynesians, being of much smaller stature (rather below the middle size), and of far darker complexion (sooty brown and even black), with black frizzly hair ("mop heads"), and highly dolichocephalic (long) skulls. The crania of the extinct Kai-Colo Melaneseans, found in Viti Levu (West Fiji), show this last trait in a higher degree than any other known race; but, notwithstanding the physical differences, the Melaneseans greatly resemble the Polynesians (Samoans, Tahitians, Tongans, Maori, Hawaiians) in their usages, traditions, religion, and speech. It is noteworthy that all the Melanesian languages hitherto studied are found to belong to the Malayo-Polynesian linguistic family, and are even of more archaic type than most other members of the group. This is one of the most puzzling phenomena in the whole range of anthropology, though its explanation may lie in the insular character of the Melanesian domain

exposing it more easily to contact with the seafaring Polynesians, from whom they may have received their present languages, together with many social usages, at a very remote period. In general, however, they stand at a considerably lower stage of culture, and, although more industrious under European control (hence making good coolies), they are still for the most part mere savages, inveterate head-hunters, and cannibals. Yet some have been brought under Christian influences sufficiently to have abandoned these practices, by several zealous Protestant missionaries, such as Bishop Pattison (murdered in 1871) and Dr. Codrington, first of living Melanesian scholars. (H. C. von der Gabelentz, *Die Melanesische Sprache*, 1873; R. H. Codrington, *The Melanesian Languages*, 1885.)

Melbourne, the capital of Victoria, Australia, derives its name from the Prime Minister in the early part of whose period of office it was founded. It occupies a fine, but not picturesque, site at the head of Hobson's Bay, a northern inlet of the large bay of Port Phillip, the actual city being 3 miles inland on the Yarra river; but the suburbs extend five miles on all sides of this centre, and line the shore for a space of 10 miles. The streets are laid out in the rectangular fashion adopted in America, are all broad and well built, with numerous parks and gardens. Among the handsome public buildings the Parliament Houses, Public Library, University, National Museum, Wilson Hall, Town Halls, and Exhibition Building, deserve notice, whilst hospitals, colleges, churches, and asylums abound. Both Anglicans and Roman Catholics have bishops here, and maintain cathedrals of architectural merit. Journalism is established on a secure basis, and the leading newspapers vie with those of London in value and ability. Railways afford ready communication with the suburbs, with Sydney, 500 miles distant to the N.E., with Gippsland, and with South Australia. The climate is healthy and equable, though hot winds from the interior occasionally raise the temperature and fill the air with dust. The shipping of Melbourne has developed enormously within the last thirty years, and the colony is in direct communication by steam or sail with every part of the world. Wool, preserved meat, wheat, gold, and some kinds of timber are the chief exports, the manufactured goods of Europe and the west being taken in exchange, though recently Victoria has made great strides in the matter of home industries. Until 1835 no white man had set foot in this land, yet in 1838 town lots were worth £250 an acre, and would be cheap now at 100 times that price. In 1841 there were 11,000 inhabitants, but the great impulse to the growth of the place was given by the discovery of gold in 1851. The population at once rose to 100,000, and the colony was made independent of New South Wales.

Melbourne, WILLIAM LAMB, 2ND VISCOUNT, was born in 1779, and entered the House of Commons in 1805 as a moderate Whig. Canning gave him the Chief Secretaryship for Ireland, which he held with much credit, and he also served under Lord Goderich and the Duke of Wellington. In 1828 he succeeded to the peerage, joined Earl

Grey's Cabinet as Home Secretary, and had a large share in passing the Reform Bill. He became Premier in 1834, holding office until 1841, in spite of declining popularity. Every device was used to discredit him, and in 1836 he was unsuccessfully sued for misconduct with the Hon. Caroline Norton, the gifted daughter of Thomas Sheridan. He secured the thorough confidence and esteem of the youthful Queen, a circumstance that enabled him no doubt to keep in office for so long, in spite of incapacity for business and inattention to duties. After his retirement he took little interest in politics, dying at Melbourne House, Derbyshire, in 1848.

Melchites, a name applied after the Council of Chalcedon (A.D. 451) to orthodox members of the Eastern Church by the Nestorians or Monophysites. The term is also applied to members of Christian communities in Syria and Egypt which once belonged to the Greek Church but have entered into communion with the Latin Church.

Melilot (*Melilotus officinalis*), an annual or biennial leguminous plant, growing erect, two or three feet or more high, branched, and sometimes woody. Its leaves have bristle-like stipules, long stalks, and three stalked leaflets: and its small yellow flowers are in long racemes, and droop to one side of the stem. The short, straight pods become black, and contain one or two seeds each. When dry the plant has the fragrance of new-mown hay from the presence of the fragrant principle *coumarin* ($C_9H_6O_2$). Its flowers are sold by herbalists as *balsam flowers*. It occurs in a wild state throughout Europe and Asia.

Melinite, an explosive, believed to be composed of fused picric acid, mixed with guncotton, dissolved in ether, and compacted into granules. In some cases gum-arabic and chlorate of potash are said to be added. Its specific gravity is 1.7. It is exploded by a detonator, and upon explosion produces large quantities of poisonous carbonic acid gas. Secrecy is maintained as to its manufacture, owing to the fact that the process is the property of the French Government. The use of picric acid as a military explosive was first studied and patented in 1885 by M. Turpin, who it is known transferred some of the results of his researches to the French War Office. All picric explosives are powerful, but many are subject to instability.

Melissyl Alcohol, an alcohol of composition $C_{30}H_{61}OH$, which occurs united with palmitic acid in beeswax. If oxidised, it yields *melissic acid*, $C_{30}H_{60}O_2$, a waxy substance which melts at 88° .

Melodrama, properly a stage-play set to music, or a play in which music is freely employed. The term is now used, with little or no reference to incidental music, to designate a stage-play of a romantic character in which a highly sensational plot with extravagant scenes and situations leads up to a cheerful solution.

Melon (*Cucumis melo*), a member of the gourd family (Cucurbitaceæ), probably native to India and cultivated in Asia and in Egypt from very early times. The melon is generally annual, and

has tendrils, variable palmately-lobed leaves, monœcious flowers, and deeply five-lobed bell-shaped corollas. Having so long been cultivated, its fruit is extremely variable. It may be globular, oblate, ovoid, or even serpent-like, smooth, netted, ribbed, or warty, green or yellow externally, and white, green, salmon or red in the "flesh," and from one to twelve or more inches in diameter. Cabul, Bokhara, and Ispahan are specially celebrated for their melons, many of the "races" in cultivation having originated in Persia. Columbus introduced melons into America, where they flourish, as they do also in Australia. True melons were formerly termed *musk melons* to distinguish them from *water melons* (*Citrullus vulgaris*), native to tropical Africa, cultivated in ancient Egypt and now in most hot countries. A large number of melons and water-melons are imported into England from Malaga and Lisbon.

Melrose, a pleasant village on the Tweed in Roxburghshire, Scotland, 37 miles S.E. of Edinburgh. It is famous for the ruins of the Cistercian abbey-church, built originally by David in the 11th century, but twice destroyed, the fragments remaining being those of the third church, which was erected between 1485 and 1530. It is a fine example of the Middle Pointed Gothic, with foreshadowings of the Flamboyant and Perpendicular styles. The heart of Bruce, with the bodies of Alexander II. and many Border celebrities, were buried here. Sir Walter Scott recorded the glories of the abbey in *The Lay of the Last Minstrel*, and Abbotsford, his country seat, is close to the town.

Melting-point. The following table gives the melting- or freezing-points of a few important and well-known substances:—

	Centigrade	or	Fahrenheit.
Mercury	-40°		
Turpentine oil	-27°		
Ice	0°		32°
Butter	33°		91°
Phosphorus	44°		111°
Spermaceti	between 44° & 49° C.	or	between 111° & 120° F.
Wax	65° & 68°		149° & 154°
Fusible metal	68° & 94°		154° & 201°
(according to its composition.)			
Sulphur	114°	Centigrade	or 237° Fahrenheit.
Tin	about 230°		446°
Lead	330°		626°
Zinc	430°		806°
Silver	1000°		1832°
Copper	1050°		1922°
Gold	1250°		2282°
Iron	1550°		2822°
Platinum	1780°		3236°

Melusina, or MÉLUSINE, a fairy of French romance, daughter of the fairy Pressina and Elenas, King of Albania. She was the wife of Raymond, Count of Poitiers. Owing to a malignant charm she used to become a serpent from the waist downwards every Saturday. On discovering this, her husband imprisoned her in a dungeon of the castle of Lusignan, where traditions of her still survive.

Melville, ANDREW, was born near Montrose in 1545, educated at St. Andrews, and sent to Paris to complete his studies. Thence he passed to Geneva, where he obtained a professorship. In 1574 he returned to Scotland, and was elected

principal of the university of Glasgow, being transferred six years later to St. Mary's College, St. Andrews. He was imprisoned first in the house of the Bishop of London, and then in the Tower, his offence having been a violent attack on the Archbishop of Canterbury at the time of the Hampton Court Conference. In 1611 he was released, but forbidden to return to Scotland. The university of Sedan offered him a professorship, and there he died in 1622.

Melville, GEORGE JOHN WHYTE. was born about 1820, went to Eton, entered the Coldstream Guards, and retired as a captain in 1849. In 1853 he made his *début* in literature with *Digby Grand*. He at once became popular, and some twenty-five works of fiction flowed from his pen before he met his death in the hunting field at the age of 58.

Melville, HENRY DUNDAS, VISCOUNT, was born in 1741, educated in Edinburgh, and admitted to the Scotch bar, becoming Solicitor-General and Lord Advocate. In 1774 he entered Parliament as a supporter of Lord North, but joined Pitt in 1784, being appointed successively to the Board of Control, the Home Office, and War Office. Created Viscount Melville in 1802, he was impeached in 1806 for appropriating public money. Though acquitted, he was made the scapegoat for a rotten system of official corruption, being personally quite innocent, and he retired from public life, dying in 1811.

Melville Island, in the North Polar Sea, lat. 75° N., long. 110° W., was discovered and named by Parry, who wintered there in 1819-20. It is 200 miles long by 130 miles broad, and adjoins Prince Patrick Island, from which it is separated by Kellet Strait, Melville Sound intervening between it and Prince Albert's Land. MELVILLE PENINSULA is of about the same area, but lies farther S. and E., forming the extreme rear of the Gulf of Boothia. A large island of the same name also lies off the coast of north Australia, and was colonised by the British, who founded, but soon abandoned, the settlement of Port Dundas.

Memel, a fortified port, in the district of Königsberg, Prussia, Germany, stands at the mouth of the Dange, just where the Kürische Haff opens into the Baltic Sea, and is the chief centre of the corn, timber, and seed trade of the neighbouring provinces. It was founded in 1252 by the Teutonic Knights, and soon became prosperous, joining the Hanseatic League, and subsequently being annexed by Prussia after a brief possession by Sweden. It has suffered much from war and fire, and was practically rebuilt in 1854. Ship-building, distilling, iron-founding, brewing, and the manufacture of chemicals are chief industries. The Peace of Tilsit was signed on an island in the Niemen close by.

Memling, HANS, flourished as a painter in Bruges during the latter part of the 15th century, but his personal existence is shrouded in mystery. The oldest of his recognised productions is *John the Baptist*, in the Munich Gallery, and that is assigned to 1470. The famous *Last Judgment* at Dantzic was completed three years later and sold to the Medici, but captured by a privateer on its

way south. *The Seven Griefs of Mary*, now at Turin, dates from 1477, and the masterpieces in the Hospital of St. John at Bruges are not earlier than 1479. To the same period belong the *Madonna and Saints* in the Louvre, and the *Virgin and Child* given by Sir J. Donne to Chiswick church. The exact date of his death is unknown, but the archives of Bruges prove that it must have been before 1495.

Memnon, in Greek mythology, the son of Tithonus and Eos, and so connected with Priam, is said to have come from Ethiopia to assist the Trojans, and to have been slain by Achilles in revenge for the death of Antilochus. Modern philologists explain his existence as a mere solar myth; and if the black statue at Thebes, which uttered sounds at dawn, was really a representation of the hero, this interpretation derives strength from the fact. Egyptian tradition, however, assigns it to King Amenophis III. A Memnonium is mentioned as existing at Susa, and similar monuments are referred to in various other places.

Memphis. 1. The Greek name of MENF, the capital of Egypt from its foundation by Menes four to five thousand years B.C., until the 9th Dynasty about 3400. It remained the second city even up to the time of Strabo, though much injured by the invasion of Cambyses, the foundation of Fostat, and the rise of Alexandria. The final decay set in under the Saracens in the 7th century, but the majestic ruins of temples, tombs, and palaces still extant on the W. bank of the Nile 10 miles S. of Cairo will bear testimony to its pristine greatness for many centuries to come.

2. The capital of Shelby county, Tennessee, U.S.A., stands on the E. bank of the Mississippi, near the confluence of the Wolf river, 450 miles S. of the St. Louis, and 826 miles N. of New Orleans. Occupying a cliff some fifty feet above the water, it is a handsome and now prosperous city. A large trade is done in cotton and other local produce, railway as well as river affording means of transit. The Federals captured the place in 1862 after a sharp naval engagement. In 1878-79 the population was decimated by yellow fever.

Menai Strait divides the Isle of Anglesea from the county of Carnarvon, North Wales, and is 14 miles long with a breadth varying from two miles to 200 yards. The depth admits of the passage of small vessels only. Until 1826, when Telford completed his suspension bridge (560 feet in length and 100 feet above the water), travellers proceeding to Holyhead on their way to Ireland were transported by ferry. In 1849-50 Stephenson and Fairbairn built the famous Britannia tubular railway bridge, one of the triumphs of engineering skill; the total span is 1,380 feet.

Menander, the founder of the New Athenian Comedy, was born in 342 B.C., and died at the age of fifty-two. Instead of satirising real personages (as Aristophanes had done) he created types of character illustrating broadly the virtues and vices of mankind. Of his hundred plays only a few scattered lines exist, but we get some idea of his style and method from Terence, who closely

imitated him. Plautus, too, adopted his general scheme of dramatic construction. He was accidentally drowned whilst swimming at the Piræus.

Mencius, or MENG TSEN, the name of a Chinese philosopher who flourished in the 4th century B.C. He is ranked by his countrymen next to Confucius, under whose grandson he studied. His early years were devoted to elucidating the sacred books, and when ripe for the task he undertook to add a fourth volume, which bears his name. Morality is therein expounded in a series of dialogues, which, through the verbiage of Chinese style, reveal originality and boldness. It has been translated into Latin by Stanislas Julien, into French by Pauthier, and into English by Collicie.

Mendelssohn, MOSES, was born at Dessau in 1729. In 1755 he published his first book, written jointly with Lessing, the title being *Pope as a Metaphysician*. This was followed by *Letters on the Feelings*, *Letter to Lavater*, *Phædo or the Immortality of the Soul*, *A Code of Jewish Laws and Rites*, and *Jerusalem*, a treatise on the influence of religion. His efforts were chiefly intended to bring about a reconciliation between Christianity and Judaism. When he died in 1786 he left an ample fortune, got in the silk trade, to his many children.

Mendelssohn-Bartholdy, FELIX, grandson of the foregoing, was born at Hamburg in 1809, his father, a wealthy banker, having abjured Judaism and adopted his wife's Italian name. From earliest childhood both he and his sister Fanny showed peculiar sensitiveness to music, and Madame Bartholdy encouraged the tendency. Felix made his first appearance as a pianist in 1817, and he began to compose at the age of twelve. His fame reached Goethe, who invited him to Weimar and accepted the dedication of his first work, viz. three piano quartets. Moscheles and Cherubini heard him, and gave further encouragement. In 1825 he produced an opera in Berlin, which was not a complete success, and in 1826 he had already composed the overture to the *Midsummer Night's Dream*. Three years later he appeared at the Philharmonic Society's concerts in London, where the overture was first played, and after a visit to Italy he returned to England in 1833. His *Stranger and Son*, *Isles of Fingal*, *Walpurgis Nacht*, *Concerto in G Minor*, and *Symphony in A Major* belong to this period. In 1835 he was deeply affected by the loss of his father, and in 1836 he produced his first oratorio, *St. Paul*, at Düsseldorf, bringing it to England, along with his newly-wedded bride, the following summer. From 1838 to 1846 he divided his time between London and Leipzig, holding a directorship in the latter town and an appointment conferred by the king of Prussia. *The Hymn of Praise*, the musical settings of *Antigone* and *Edipus Coloneus*, the *Symphony in A Minor*, *Lauda Sion*, and the overture to *Ruy Blas* were his chief productions during those years. It was for the Birmingham Festival of 1847 that he composed *Elijah*, and he directed the performance. His health now gave way, and, unwilling or unable to rest, although he took a brief holiday in Switzerland, he wrote the *Quartet*

in *F Minor*, sketched out the oratorio of *Christ*, began an opera *Lorelei*, and had two others in view. Paralysis came on quite suddenly and he died at Leipzig in 1847.

Mendicancy. [VAGRANTS.]

Mendoza, a province and its capital in the Argentine Confederation, South America. The former has an area of 54,000 square miles, mostly level except in the W., where it runs up to the Andes, which separate it from Chili. It is drained by the river Mendoza, flowing N. for 200 miles and discharging itself into Lake Guanacache. The soil, though sandy, produces wheat, maize, wine, and various fruits. Silver is mined to some extent, and the breeding of mules adds to the general resources. Mendoza, the capital, stands on a high plateau close to the Andes, and 150 miles N.E. of Valparaiso. It is a considerable depôt for trans-continental trade, but has suffered much from earthquakes, especially in 1861.

Mendoza, DIEGO HURTADO DE, was born at Granada in 1503, and, after a distinguished career at Salamanca, was employed by Charles V. as an envoy to Venice, the Council of Trent, and Rome. For six years he commanded the Imperial forces in Tuscany. Under Philip II. he fell into disgrace, and devoted his remaining years to writing the history of the war against the Moors, dying in 1575. He was a great patron of learning, and his valuable collection of books and MSS. is in the Escorial.

Menhir, a single standing stone. [STANDING STONES.]

Menière's Disease, a disease in which sudden attacks of vertigo or giddiness occur, associated with noises in the ear and usually with some degree of deafness. M. Menière was the first to show that such attacks are due to mischief involving the semicircular canals of the internal ear.

Meningitis, inflammation of the membranes which invest the brain and spinal cord. The most common form of meningitis is that which is associated with tubercular disease, and which particularly affects the membranes at the base of the brain. The early symptoms of tubercular meningitis (acute hydrocephalus, as it is sometimes called) are headache, vomiting, and some degree of fever. In the second stage the patient becomes drowsy, the fever diminishes, the breathing is often irregular, various eye symptoms appear, and what is known as the hydrocephalic cry may be present. In the third stage the patient becomes comatose, and convulsions and paralysis often occur. The disease generally lasts about a fortnight, and the symptoms are so variable that there is sometimes much difficulty in diagnosis. Optic neuritis is frequently present, and may furnish a clue to the nature of the malady; another symptom, to which some importance has been attached, is the "*tache cérébrale*"; this phenomenon, however, may manifest itself quite independently of meningitis. In cases of tubercular meningitis there is often evidence of the deposit of tubercle in other parts of the body. Recovery from the disease is very rare.

Meningitis sometimes occurs altogether independently of tubercular mischief. It may be set up by injury. Cases of simple meningitis sometimes recover. A form of disease, known as epidemic cerebro-spinal-meningitis, has been described as occurring during the present century in France, Ireland, the United States, and other countries. This disease is said to be infectious. It is very rarely met with in this country.

Meningocele, a protrusion of a part of the cranial contents through an aperture in the skull, such aperture resulting from defective development of the cranial bones. If the tumour contain brain substance, it is called an encephalocele (q.v.); when the membranes covering the brain alone protrude, it is said to be a meningocele. The most common situations for such protrusions are the occipital region in the middle line of the skull and the root of the nose.

Mennonites, members of a sect which arose in Friesland soon after 1500, and was named after MENNO SIMONS (1492-1561), one of the most prominent professors of their tenets. They advocate baptism upon profession of faith, and refuse to take oaths, or to take any part in war. In the 17th century the sect divided, the Lowland Mennonites separating from the Upland Mennonites or Ammanites, who preserved the original vigour of the sect. The sect is found in the Low Countries, Germany, and Russia, and also (in the largest numbers) in the United States, where several divisions are recognised.

Menominees, North American aborigines, a branch of the Algonquian family, whose hunting-grounds were in the present states of Wisconsin and Michigan; here the name still survives in the river Menominee, flowing to Lake Michigan, and Menominee county in the state of Michigan. The tribe itself, at one time very numerous, is now reduced to about 1,300 persons, confined to the Green Bay Agency, where they have made some progress in European culture.

Menopome, either of the two species of Amphibian genus Menopoma, from the Mississippi basin, and having the gill-slits persistent. With the Giant Salamander, they form a family. They are ugly and voracious; and such names as "mud-devil" and "hell-bender" show the abhorrence in which they are held.

Menorrhagia, the loss of an excessive quantity of blood at the menstrual periods. This symptom may be due to inflammatory conditions, or to fibroid tumours, polypi, or malignant disease affecting the uterus. It also occurs in cases of incomplete abortion. It may arise, moreover, from certain constitutional defects—as, for example, in scurvy—and is sometimes associated with affection of the heart or liver.

Menschikoff, ALEXANDER DANILOVITCH, the son of a peasant, was born at Moscow in 1672. Peter the Great took him into his service, and gave him his complete confidence. He accompanied the Czar to England and Holland, became governor of Ingria, defeated the Swedes at Kalisch (1706),

received a marshal's bâton for services at Pultowa, but fell into disgrace for restoring Stettin to Prussia. Under Catherine he returned to power, and his daughter married Peter II.; but when that sovereign made Dolgorouki his mistress, he banished his son-in-law, who died in Siberia in 1729.

Menschikoff, ALEXANDER SERGEVITCH, great-grandson of the foregoing, was born in 1789, and early attained the rank of general. In 1825 the Czar Nicholas sent him as envoy to Persia, and he held a military command at the siege of Varna. In 1831 he became governor of Finland and admiral. When the dispute with Turkey as to the protection of the Holy Places grew to a head, Menschikoff was sent to Constantinople as ambassador. He brought about the Crimean War (1854-56), and took command of the Russian forces. After his defeat at the Alma and the death of Nicholas, he was recalled, and lived in retirement until 1869. He was the head of the Old Russian party.

Menstruation. The menstrual discharge usually manifests itself at about 14 or 15 years of age, and continues until the period of the climacteric, which occurs at about the 50th year. The discharge consists of blood, epithelium, and mucus. It lasts, as a rule, from three to six days, and recurs at intervals of a lunar month or thereabouts. The catamenial periods, as they are called, are accompanied, as a rule, by some lumbar pain and by a sense of fatigue; they are related in some way not precisely understood to the discharge of ova from the ovary. The menstrual discharge is absent, as a rule, during pregnancy and the period of lactation.

Mensuration is that branch of applied mathematics which deals with the lengths of lines, areas of surfaces, and volumes of solids, however irregular may be their form. The length of a line is expressed by saying how many units (such as feet, chains, metres) it contains, and it is practically measured by applying the actual unit in the form of a rule or chain to it. The area of a surface is expressed in sums of some unit, such as a square foot, or an acre, but the unit itself does not require to be actually placed on the surface. It is sufficient to measure the lengths of certain lines, and from these the area can be calculated. If we are dealing with a rectangular figure, the area is given by multiplying the lengths of two adjacent sides. The area of a triangle is half the product of the base and height, and the area of any plane figure, such as a field, can be found by dividing it up into suitable triangles, finding their areas and adding the results. If the boundary of the field is curved, certain portions are taken which will approximate to parts of a circle, an ellipse, or other such curves, and calculating the areas by using the known formulæ for those figures. The volumes of solids are found by the application of similar rules. All the rules and formulæ used in mensuration can be proved by geometry, etc., but it is not necessary to know the proof in order to use the rules. Since these rules are few and simple, mensuration is an easy branch of practical science.

Menthol. [CAMPHORS.]

Mentone (Fr. MENTON) is a town in the department of the Alpes Maritimes, France, 12 miles N.E. of Nice by railway, on the shore of the Mediterranean. It still retains among all but Frenchmen its Italian name, having only been bought by France from Monaco in 1860, before which date the place had acquired considerable repute as a resort for consumptive patients. Sheltered by the Maritime Alps on the N. and by the Tête du Chien on the W. from cold winds, it enjoys a mild and slightly relaxing climate. Considerable damage was done by an earthquake in 1887.

Menzel, WOLFGANG (1798-1873), the son of a well-to-do physician, was born at Waldenburg, Silesia. At Jena and at Bönn, where he became a student, his democratic views were so pronounced that he had to seek refuge in Switzerland. He did not confine his discontent to politics, but made a violent onslaught upon Goethe and his followers. Many works came from his pen on history, literature, and criticism, besides some verse. In 1825 he settled at Stuttgart as editor of the *Litteraturblatt*. His last utterances dealt with the war of 1866 and the attitude of France, a country which he cordially hated.

Mephistopheles. [SATAN.]

Mercantile System, in political economy the system aimed at by Colbert in France, and numerous followers in various countries, of establishing an excess in the value of exports over that of imports, the difference, called "the balance of trade" (q.v.), being adjusted by the annual importation of specie, the amount of which measures the advantages of trade. This theory, unless received with important modifications, involves the fallacy that gold and silver alone are wealth. Its grounds, however, were chiefly political, a large reserve of specie being thought necessary in case of war—a view exploded by Adam Smith.

Mercator (Latinised form of KREMER), GERHARD, geographer and map-maker, born in 1512 at Rupelmonde, in Flanders, was cosmographer to the Duke of Cleves, and died at Duisburg in 1594. He is particularly known in consequence of his invention, in 1569, of the principle which is now called Mercator's projection. In this the surface of the globe, or any part of it, is represented on a map or chart, not as spherical but as plane, and the parallels of latitude and meridians of longitude are denoted by straight, instead of by curved, lines. The end is attained, of course, by varying the scale in different regions, but, as the regions which have to be most magnified—namely, the polar ones—are those which are least visited, the exaggeration does not materially affect the value of the system. It is employed universally in sea charts, also in many of the best maps.

Mercenaries, professional soldiers, who enter a foreign service for pay, originally so called to distinguish them from troops who followed their feudal lords. The most noted associations of mercenaries are the Varangians of Constantinople in the 10th century, the Normans in Italy and Sicily in the 11th century, the company of Sir John Hawkwood in Italy in

the 14th century, the Scotch and English companies during the Thirty Years' War, and the Swiss.

Mercia, that part of Saxon England which bordered on the Welsh Marches; hence its name. The kingdom was founded in the 6th century, and at first covered little more than Staffordshire. Penda, its first great king, not only changed it from a mass of independent settlements into one great kingdom, but even for a time checked the progress of Christianity. His nephew, Wulfhere, re-established the position of Mercia, which had been lost at Penda's death, but submitted to Christianity. During the 8th century under Æthelbald, Offa, and Cenwulf, it was the most powerful of the Saxon kingdoms; but after the battle of Ellendun (823) it finally succumbed to Wessex, though there was a revolt under Edwy, and a kind of semi-independence followed its establishment by Cnut as one of the four earldoms.

Mercurial Pendulum, a special form of pendulum, invented by Graham, compensated for temperature variations by means of a reservoir of mercury that takes the place of the ordinary pendulum bob. [PENDULUM.]

Mercury, in astronomy, is the smallest planet, except the planetoids, in the solar system, and the one nearest the sun. It is never seen for more than two hours before sunrise or after sunset, and is not always visible then; but when it does appear, it is extremely brilliant. It was considered to have no spots on its surface, but the discovery of a very faint one during this century enabled the length of its day to be calculated as 24 hours 5½ minutes. It takes 88 days to travel round the sun, its mean distance from that body being 35,000,000 miles. Even when it is most distant the sun appears four and a half times as big to it as it does to us, and when the two are at their nearest, this small planet gets ten times as much light and heat as we do. Forms of life, if any, must, therefore, be very different from the ones we know, unless the intense heat is tempered by an atmosphere of some kind. Mercury has no satellite, so its density has been calculated from its supposed effect on a passing comet. It is believed to be one-sixth greater than the density of the earth, and its gravity is supposed to be such that a pound would weigh about 7 oz. there, rendering motion of all kinds extremely easy. The diameter of Mercury is 3,060 miles, and its axis is by some supposed to be much inclined to the plane of its orbit. It is, however, so small and difficult to observe, that comparatively little is known of it, its true shape, and the position of its axis, with its effects on its seasons, being matters of conjecture only.

Mercury is a metallic element which, though not known since such ancient times as iron and some of the other metals, has still been known since some centuries B.C., and from its remarkable properties attracted the attention of the earlier alchemists. It exists native to a slight extent, occurring as small globules in certain of its ores. The chief ore is the sulphide, cinnabar (q.v.), which is found largely in Almaden, Idria, Mexico, and

California. The preparation of the metal from this source is mentioned in the writings of Theophrastus and Dioscorides, to whom mercury was known as *liquid silver* and *water silver*. The Romans named it similarly *hydrargyrum* or *argentum vivum*. The alchemists believed mercury to be a constituent of all metals, and its compounds were by them well examined, and many employed medicinally. From cinnabar it is obtained by distillation in suitable furnaces, either alone or mixed with lime. The vapours of mercury pass off, and are condensed in receivers arranged for the purpose, and the metal is afterwards purified by redistillation. It is a silver-white liquid metal, being the only metal and, with exception of bromine, the only element liquid at ordinary temperatures. At about -40° C. (or F.) it freezes to a malleable white mass. It has the high specific gravity of 13.595, so that iron, lead, and all the common metals, except gold, can float upon it. It boils at about 360° C., but gives off vapour at much lower temperatures, and can be readily distilled *in vacuo*. Its atomic weight is 200, and it is represented by the symbol Hg (hydrargyrum). Mercury forms two oxides—*mercurous*, or black oxide (Hg_2O), and mercuric oxide (HgO) or red precipitate. This latter has been long known, and is used in medicine and frequently in the chemical laboratory. From these oxides two series of salts are obtainable, *mercurous* and *mercuric* salts. The chlorides, known respectively as *calomel* and *corrosive sublimate* (see below), are the most important of the mercury salts, but others are also in general use. Mercuric iodide is remarkable inasmuch as it exists in two forms: (1) a *scarlet*, the more stable form, which, on heating, passes into a (2) *yellow* variety, which, upon mechanical disturbance, immediately changes back to the red. The metal itself is very largely employed in chemical and physical work: it is extensively used for the preparation of barometers and thermometers, for which its high specific gravity, its good conductivity of heat, small specific heat, and long range of liquidity render it specially adapted. It is much used for preparation of mirrors, manufacture of its salts, and amalgams, and for the extraction of gold and silver in certain metallurgical processes.

Mercury and its salts are largely used in medicine. Metallic mercury is administered in the form of "blue pill" and of "grey powder," either as a purgative or in the treatment of syphilis, or again "blue ointment" may be applied by inunction to produce the specific action of mercury on the system. The perchloride of mercury (corrosive sublimate) is extremely poisonous, and is a powerful disinfectant. In solution (of strength 1 in 1,000) it is much used for its germicidal properties. It is administered sometimes internally in minute doses. Subchloride of mercury (calomel) is a useful purgative, and was largely used in former days in combination with opium in the treatment of inflammatory conditions. "Black wash," which contains the black oxide, and "yellow wash," which contains the yellow oxide, are employed as external applications. The oleate of mercury is useful in syphilis and in certain skin affections, and the white precipitate ointment is a valuable parasiticide. The acid nitrate of mercury

is used as a caustic. Great care is necessary in the administration of mercury internally. The persalts are much more actively poisonous than the subsalts. The solution of corrosive sublimate has sometimes produced poisoning through being swallowed by mistake. White of egg is given in such cases, as the mercurial salt is precipitated by albumen. When small doses of mercury are administered for a long period the symptoms of "mercurialism" are produced; these are profuse salivation, swelling and ulceration of the gums, dyspepsia, anæmia, and muscular tremors and paralysis.

Meredith, GEORGE, among the foremost of English novelists, was born in Hampshire in 1828, and educated in Germany. In 1851 he published a volume of *Poems*, and four years later, his first prose work, *The Shaving of Shagpat*, a series of stories, half-imitation, half-burlesque, of the *Arabian Nights*. In 1857 German romance was treated in a similar manner in his *Farina*. In 1859 appeared *The Ordeal of Richard Feverel*. It was followed by *Eran Harrington* (1861), *Sandra Belloni* first known as *Emilia in England* (1864), with its sequel, *Vittoria* (1866), and *Rhoda Fleming* (1865). *Harry Richmond* (1871), and *Beauchamp's Career* (1875) came next, and in 1879 the most elaborate of his prose works, *The Egoist*. *The Tragic Comedians* (1881) was a romance founded on the life-story of Lassalle. It was succeeded by *Diana of the Crossways* (1885), and *One of Our Conquerors* (1891). The best of Meredith's verse, which is valued by some of his admirers even more highly than his prose, is contained in *Modern Love* (50 sonnets, 1862), *Poem: and Lyrics of the Joy of Earth* (1883), *Ballads and Poems of Tragic Life* (1887), *A Reading of Earth* (1888), and *The Empty Purse* (1892).

Merganser, any bird of the genus *Mergus*, of the duck family, with six species from the Palearctic and Nearctic regions, Brazil, and the Auckland Islands. The bill is straight and slender, hooked at the tip, and strongly toothed along the edges. Besides the Goosander (q.v.), the Red-breasted Merganser (*M. serrator*) breeds in Scotland, the Smew (*M. albellus*), sometimes called the Nun from its black-and-white plumage, visits Britain in severe winters, and the Hooded Merganser (*M. cucullatus*) is a rarer visitor. *M. brasiliensis* is from South America, and *M. australis* from the Auckland Islands.

Mericarp (from the Greek *meros*, "a part;" *karpos*, a "fruit") is a useful general term applied in botany to the parts, otherwise termed *nutlets*, or *coeci*, into which some syncarpous fruits (schizocarps) split when ripe, without exposing the seed. In the Umbelliferae (q.v.), for instance, the cremocarp splits into two mericarps (of which the so-called "caraway-seed" is a familiar example), each of which is a carpel. In Borragineae and Labiate (q.v.), on the other hand, the fruit (regma) splits into four, each of which is half a carpel. [FRUIT.]

Merida. 1. An ancient town in Spain, stands on the Guadiana, 36 miles E. of Badajoz. As Augusta Emerita it was the capital of the Roman province of Lusitania. Memorials of its history are a

Moorish palace, and Roman remains, including a fine bridge, and the Arch of Santiago, both of which were built by Trajan.

2. The chief town of Yucatan, a province of Mexico, founded in 1542. It has a cathedral, university, public library, and conservatory of music.

3. The capital of the state of Los Andes, Venezuela, stands more than 5,000 feet above the level of the sea. It is a university and cathedral city, and manufactures carpets. In 1812 an earthquake did great damage.

Meridian, in astronomy, is the great circle in which any plane containing the earth's axis cuts the celestial sphere. The meridian of any place passes through the zenith of that place, and cuts the horizon in the *meridian line*. This line gives the direction of north or south. When the sun crosses the meridian of any place, it is noon there. Stars are higher in the heavens when they reach the meridian than at other parts of their path, and are more accurately observed then, since the distorting effect of refraction is in that position as little as possible. These observations are made with *meridian circles*.

Mérimée, PROSPER (1803-70), a distinguished French man of letters, was born at Paris. He entered the public service, and in 1831 was appointed inspector-general of historic monuments. A personal friend of the mother of the Empress Eugénie, he was much attached to the Bonapartes, and became chief of the Ministry of Marine (1853), and president of the Commission for the Reorganisation of the Imperial Library (1858), besides being employed diplomatically. He was admitted to the Académie Française in 1844, and was a leading member of the Académie des Inscriptions. He died at Cannes after a lingering illness. His earliest works were a pretended Spanish comedy, and a collection of pretended Illyrian songs (*Guzla*). Chief among his historical works were *Un Chronique de Charles IX.* (1829), *En Corse* (1840), *Monuments Historiques* (1843), and *Les Faux Démétrius* (1853). His fame as a writer chiefly rests upon his short stories, *Contes et Nouvelles* (1846), *Nouvelles* (1852), and *Dernières Nouvelles* (1874). His *Lettres à une Inconnue*, a charming and interesting autobiographical collection, were published in 1873, and succeeded in 1875 by *Lettres à une autre Inconnue*.

Merioneth (MEIRIONYDD), a county in north Wales, bounded on the north by Carnarvon and Denbigh, on the south and east by Montgomery and Denbigh, and on the west by Cardigan Bay. It is 45 miles long, and has an area of 385,291 acres. Its surface is very mountainous, and the county contains the peaks of Cader Idris, Aran Mowddwy, Arenig-Fawr, and several others of over 2,000 feet. The scenery in the valleys and on the sea-coast is very fine. There are several lakes, the chief of which is that of Bala, called in Welsh Llyn Tegid ("the fair lake"). Barmouth and Aberdovey have good harbours, but the coast is generally dangerous, owing to shoals and sandbanks. The climate varies, according to altitude, from cold to mild, and the soil is poor. Near

Festiniog there are large slate quarries, and at Dolgelly woollen goods are made. The county returns one member to Parliament.

Meristem (from the Gk. *meristos*, "divisible") is a general term in vegetable histology (q.v.) for all tissues in which the cells, by retaining their protoplasm, are capable of undergoing cell-division.

Merivale, HERMAN (1806-74), was for some time fellow of Balliol College, Oxford, and professor of political economy in the university. He was afterwards successively permanent Under-Secretary for the Colonies and for India. He was author of *Historical Studies*, and continued Parke's *Life of Sir P. Francis*. CHARLES MERIVALE, his brother, was born in 1808, and became successively fellow and tutor of St. John's College, Cambridge, Hulsean and Boyle lecturer, chaplain to the Speaker, and Dean of Ely (1869). His chief works are *The Fall of the Roman Republic* (1853), a *History of the Romans under the Empire* (1859-62, in eight volumes), and a *General History of Rome* (1873).

Merlin, the magician and sage of the Arthurian legends, is placed by Geoffrey of Monmouth in the 5th century. He is said to have been the son of a demon and a Welsh princess, and to have gained the power after his baptism of working miracles. In French literature his story is told by Wace and Robert de Borrou. Merlin's *Prophecies* appeared in French, English, and Latin in the 16th century. A Scottish Merlin is said to have lived in the 6th century; while escaping from some enemies across the Tweed at Drummelzier, where his grave is still shown, he was impaled on a hidden stake. His *Prophecies*, published at Edinburgh in 1615, embody those of the Cambrian Merlin. The latter is a character in Tennyson's *Idylls of the King*.

Mermaid, a mythical being represented as having the body of a woman and the tail of a fish, and living in the sea. The typical mermaid was beautiful; like the Lorelei, she was generally occupied in combing her long hair, and in her left hand she carried a mirror. These creatures figure largely in folk-lore, and were supposed to be capable of feeling or feigning affection for, and forming connections with, men, sometimes on shore, sometimes in caves in the depths of the sea. Similar stories are told of mermen and their relations to women. In most cases these connections ended badly for the human partner. The origin of the myth seems to lie in the worship of nature-forces, and it was just as natural to imagine a water-spirit with the tail of a fish as a satyr or faun with the hind-legs of a goat. Cuvier thought that the ancients took their notions of mermaids from the manatees and dugongs. It would probably be more correct to say that the observation of these animals by moderns strengthened the old superstition, and was no more the cause of it than any of the fabrications of monkey and fish-skin formerly exhibited as mermaids at village fairs.

Merovingians. [FRANCE.]

Merseburg, a town in Prussian Saxony, on the right bank of the Saale, 60 miles S.S.E. of

Magdeburg, formerly the residence of the dukes of Sachsen-Merseburg. It has a fine cathedral, the choir of which dates from the 11th century, and a 15th-century castle. Merseburg has been the scene of two battles: Henry the Fowler defeated the Hungarians there in 934, and Rudolf of Swabia (whose bronze effigy is in the cathedral) encountered defeat and death from Henry IV. in 1080.

Mersey, THE RIVER, is formed from the junction of the Goyt and Etherow in the north-east of Cheshire. During the greater part of its course of 68 miles it forms the boundary between Lancashire and Cheshire. Its chief affluent is the Irwell, from the point of its junction with which stream it is navigable to the mouth. Navigation is aided by sea-walls and good pilotage. The estuary is entered on the Cheshire side by the Manchester ship-canal, and a tunnel connecting Liverpool and Birkenhead was made under the water in 1886.

Merthyr Tydvil, a town in Glamorganshire, stands on the Taff, at the apex of a triangle of which Swansea and Cardiff are the points at the base. It is the centre of the South Wales iron and steel manufacture and of the Glamorganshire coal-field. The growth of the place dates entirely from the manufacturing era, and it has no buildings with any pretence to beauty, while its sanitary arrangements were for a long time far from perfect. The parliamentary borough, which was formed in 1867, includes Aberdare and other environs, and now returns two members.

Merv (the ancient *Margiana*), an oasis, 60 miles long and 40 broad, situated between Persia and Bokhara. A town built in its midst by Alexander the Great became afterwards the capital of the Arab province of Khorassan. After attaining a high degree of splendour under the Seljuk Turks it was taken by the Mongols in 1221. The Persians held it during three centuries, but in 1787 it fell to the Emir of Bokhara. The oasis of Merv next became the property of the Turkomans, who, after holding it nearly 30 years, were obliged to see it seized by the Russians in 1883. The district is well-watered by the river Murghab, and yields wheat and other crops. Horses, camels, and sheep are well pastured; the men work in silver, and the women weave. The Russians opened in 1886 a railway connecting Merv with Michailovsk, a port on the Caspian Sea,

Méryon, CHARLES (1821-68), a great French etcher, was the son of an English physician and a French ballet-dancer. After serving in the French navy and sailing round the world, he settled down to an artistic career in Paris in 1846. Between 1850 and 1854 he produced his *Stryge*, *Rue des Mauvais Garçons*, and *Abside de Notre-Dame*, works which are now held by connoisseurs to rank with those of Dürer and Rembrandt. In his lifetime, however, Méryon's talents were not recognised; after recovering once, he had finally to be placed in the lunatic asylum at Charenton, where he died.

Mesentery. The radial muscular plate which occurs in the Anthozoa (q.v.). They support the digestive tube and the reproductive organs: they divide the body-cavity into a number of chambers

or loculi. In the human body the abdominal contents are enveloped in the folds of the great serous membrane known as the peritoneum. The folds of peritoneum which envelop the small intestine pass backwards to become continuous with the rest of the peritoneum in the neighbourhood of the spinal column, and the two layers of serous membrane contain the blood-vessels, nerves, and lymph vessels, which are transmitted to the small intestines. The whole connecting structure serves as a kind of ligament which tethers the intestines to the vertebral column, and is called the mesentery.

Meshed, or MASHHAD, an important town in the north-east of Persia. It has a splendid mosque built over the tomb of Imam Riza, and is the Mecca of the Shiite Moslems, or followers of Ali. As such it is visited every year by something like 700,000 pilgrims. It is also an important trade centre, the greater part of the trade being with Russia and India. Haroun-al-Raschid and Firdausi were buried near Meshed.

Mesmer, ANTON FRIEDRICH (1733-1815), author of the doctrine of animal magnetism, was born at Meersburg, near Constance. He took the degree of doctor of medicine at Vienna in 1766, his thesis being *De planetarum influxu*. In 1775 he published a *Letter to a Foreign Doctor* (Storck), in which he maintained that all bodies are susceptible to the communication of the magnetic fluid, which penetrates everything. He experimented on a patient, convinced some doctors, and created a rage for magnetism in Paris; but the refusal of a pension in exchange for the revelation of his discovery aroused suspicion, and in 1785 a commission, consisting among others of Franklin and Lavoisier, pronounced his claims to be spurious.

Mesoblast, the layer in an embryo which occurs between the external layer or *epiblast* and the internal layer or *hypoblast*.

Mesocarp, the middle tissue of a fruit, consisting typically of the mesophyll (q.v.) of the carpellary leaf or leaves. It is often fleshy and edible, as in the plums, peaches, etc., and it is then sometimes called the *sarcocarp* (from the Greek *sarx*, "flesh"); or it may be stringy, as in the almond; or even fibrous, as in the cocoanut. The term can only be employed with morphological accuracy in speaking of such superior fruits as these, and not of inferior fruits, such as the apple. [FRUIT.]

Mesogloea, the soft, gelatinous material between the endoderm and ectoderm in Coelenterata (q.v.). It is the equivalent of mesoblast in higher animals.

Mesophyll (from the Greek *mesos*, "middle;" *phyllon*, "a leaf") is the cellular tissue in the interior of the leaf (q.v.). In the ordinary horizontal leaves of flowering plants it is usually divided into two parts—(1) the *palisade tissue*, one or two layers of closely-packed, vertical, prismatic cells, rich in chlorophyll, and acting as the *assimilating tissue*, just below the upper epidermis; and (2) the *spongy mesophyll*, loosely-arranged cells, sometimes stellate, with large intercellular spaces communicating with the stomata (q.v.) in the lower epidermis. This

paler-coloured tissue is traversed by the veins of the leaf and acts mainly as the *transpiring tissue*.

Mesopotamia ("the district between the rivers"), the Biblical Aram-Naharayim, or Padan-Aram—that is, the country between the Euphrates and the Tigris. It is, of course, only a geographical expression, and is used somewhat loosely. Mesopotamia covers over 50,000 square miles of sandy but fertile soil, from which cereals, tobacco, rice, and many fruits are raised. The climate varies from extreme heat in summer to a degree of cold rare in corresponding latitudes. The inhabitants are Arabs and Kurds, who are more or less nomadic in their habits. The country contains the historic cities of Mosul (the ancient Nineveh), Edessa, Diarbekr or Amid, Nisibis, Nicephorium, and Thapsacus. Bagdad (q.v.) lies beyond to the south-east.

Mesozoic, or SECONDARY, the name applied to the great group of rocks between the Palæozoic (q.v.) and the Cainozoic or Tertiary (q.v.), because the dominant types of living organisms preserved in them are intermediate between the types now existing and those so largely dissimilar which characterise the older sedimentary rocks. Among plants, cycads, conifers, and, towards its close, angiosperms, characterise this era; among animals, the Hexacoralla, abundant sea-urchins (Eu-echinoida), brachiopods abundant in species but of few genera, oysters, scallops, and numerous other bivalves, the cephalopodous Ammonites and Belemnites, homocercal fish (teleostean at the close of the period) and the enormous variety and size of reptiles, including crocodiles, turtles, and lizards, in addition to the great extinct groups, such as the Ichthyosauria, Plesiosauria, Pterosauria, and Dinosauria. The Mesozoic group comprises the three great systems, the Triassic, Jurassic, and Cretaceous, which are described separately.

Messalina, VALERIA, wife of the Emperor Claudius, was daughter of Valerius Messala Barbatus. She was one of the wickedest women of antiquity, being notorious for her licentiousness, her cruelty, and her avarice. After she had insulted Claudius by marrying Silius, he was persuaded to order her execution, which was carried out by a prætorian tribune in the gardens of Lucullus (48 A.D.).

Messenia was the western part of the Peloponnesus. The country is fertile, with a beautiful climate. Its richness and prosperity excited the cupidity of the Spartans, who, after three wars, succeeded in taking possession of it. Many of the inhabitants expatriated themselves and went to Sicily, where they founded Messana (the modern Messina). When Epaminondas, the Theban, had defeated Sparta he brought back the Messenians to their country, where they remained independent till conquered by Rome. The province of Messenia, in modern Greece, is thinly-peopled and very backward.

Messiah, MESSIAS. "the Anointed" (Heb. *Māshīach*), the title by which the Hebrew prophets designated the deliverer whom the Jews expected God to send to restore their race to power and prosperity. Christians identify the Messiah with

Jesus, but many Jews still look for his advent. See Daniel ix. 25, 26.

Messina, the second town of Sicily, is situated on the north-east coast of the island on the Straits of Messina. It was originally called Zancle ("sickle") from the shape of its harbour. It was for some time under Carthaginian rule, but in 241 B.C. became a Roman possession. When the empire was divided, it was included in the eastern portion. It was taken by the Saracens in 831. and was the first conquest of Roger the Norman in 1061. The city next came under the sway of the German emperors, and, after a short period of French rule, was for six centuries (1282–1713) a Spanish possession. Messina was the scene of the Sicilian Vespers in 1282. of a plague in 1743, and of a terrible earthquake in 1783. It was bombarded for three days in 1848 by the Neapolitans, and held out obstinately against the Sardinians in 1861. The fine harbour of Messina made it an important port from the earliest days. It is estimated that more than 3,000 vessels enter the port every year. Fruits, wheat, wines, and oil are exported, and the inhabitants work in the coral and make up silk goods. Messina has a university, founded by the Jesuits in the 16th century, and is an archiepiscopal see. The cathedral was begun in 1098, but has suffered much and been continually rebuilt, so that it exhibits the utmost diversity of styles. There are several other handsome buildings.

Metabolism, or METASTASIS, the *stoffwechsel* of German physiological writers, is a general name for all the changes which take place within an organism from the first taking in of food to its resolution into the products of excretion or decomposition. It thus includes assimilation and protoplasmic growth, the chemical processes which generate bodily energy and build up new structures, and the breaking up of complex organic substances into such simple substances as water, urea, ammonia, or carbon-dioxide. These processes of *constructive metabolism*, *anabolism* (q.v.), or life, and of *destructive metabolism*, *katabolism* (q.v.), or death, are constantly going on side by side within the body, and there is some evidence of their alternation in a momentarily explosive manner in the protoplasm of each living cell.

Metallurgy. Although metallurgical operations have been performed for thousands of years, yet metallurgy—i.e. the separation of metals from their ores—cannot be said to have existed as a science until the present century. The earliest writings show the authors to have been possessed of a certain amount of crude metallurgical knowledge, and the Greeks and Romans were acquainted with many processes for the smelting of ores and the production of metals. Thus gold, silver, lead, copper, iron, tin, mercury, and some of the alloys of these metals were all produced before the commencement of the present era. During the alchemistic period some new metals and many new facts were discovered, but, although improvements in the methods of extracting gold and silver were invented, little advance was made in the general methods of metallurgy. Agricola and Libavius in

the 15th and 16th centuries did more than any others in this branch of scientific inquiry. In the present century, however, the processes employed became first subjected to systematic study, and the scientific facts and principles underlying the various industrial and manufacturing methods first examined; and with the study were born the great number of processes and operations employed now for numerous metallurgical purposes. As, however, each metal demands separate and distinct methods of treatment for its extraction, it is impossible to describe any general methods. They may, however, be roughly divided into (1) dry extraction, (2) wet extraction, (3) amalgamation, and (4) electrolytic processes. Of these the first is the most important, and includes all those cases where the metal is extracted from its ores by heating the ore, mixed, if necessary, with other material, *flux*, in suitably-arranged furnaces. The substances combined with the metal then oxidise and pass away as fumes—*e.g.* sulphur, arsenic, etc., or combine with the flux and form a slag, which separates from the metal—*e.g.* silica. The metal is thus usually obtained in the molten state, and is run out of the furnace or in some cases may be distilled off and condensed in suitable receivers—*e.g.* mercury, zinc. *Wet processes* are those in which the metal is separated by the use of suitable liquid solvents, *e.g.* acids, alkalis, salt solutions, by means of which the ore is dissolved, and from which solution the metal is afterwards separated. The *amalgamation processes* should really come under the preceding class. They are used only in the case of gold and silver. Mercury is added to the crushed ore and well incorporated. If the gold ore is not present in the free state, other substances are added to liberate it. The mercury forms a liquid amalgam with the precious metal; this is collected, and the mercury driven off by heat. *Electrolytic processes* are of comparatively recent date, but are becoming more important in very many branches of the science, the metal being separated by the electrolysis (q.v.) of a solution of its ore. Before being subjected to any of the above modes of extraction, however, the ore has usually to be subjected to some preliminary treatment. As it comes from the mine it is sometimes first assorted by hand-picking, the worthless stones being rejected. The ore is next reduced by means of *stamps* or *rolls* to a size suitable for the further treatment. The degree of fineness varies considerably. In the case of tin ores it is extremely fine, while for lead ores particles which pass through an $\frac{1}{8}$ -inch sieve are considered to be sufficiently small. The crushed ore is spread upon a slightly sloping floor and exposed to the action of a broad shallow stream of water, which washes off the worthless *gangue*, or matrix in which the ore is imbedded, leaving behind the concentrated richer portion of the ore. Many different methods and machines are employed for this concentration, but all depend on the fact that the ore itself is specifically heavier than the gangue, which is hence first removed by washing. After drying, the ore is usually ready for the furnace, where it is to be next operated upon; for its further treatment reference should be made to the articles on the different metals themselves.

Metals. The division of the elements into the two categories, the metals and the non-metals, is one which, though not scientific or rigid, is yet so convenient as to make it commonly adopted. Of the metals now known, six were familiar to the ancients and are mentioned in the scriptural writings. These are gold, silver, tin, copper, lead, and iron. Other metals became gradually added to the list, and at the commencement of the present century the number of metals known to chemists was raised to seventeen; while now, at its close, this number has been more than trebled. The first definition of the term was given by Geber in the 8th century, who regarded fusibility and malleability as the essential characteristics. According to his view also of the nature of these substances, they all consisted of varying quantities of mercury and sulphur, and he and the following alchemists were therefore great believers in the possibility of transmuting the common metals into gold. When the brittle metals, antimony, etc., were discovered, they were regarded as only semimetallic or pseudometallic, being not malleable, and mercury was not regarded as a metal until it had been solidified. In the 18th century the distinction between the metals and semimetals was lost, and the characteristic properties of metals were opacity, lustre, and high specific gravity. The last of these qualities had to be given up as non-essential when sodium and other light metals were discovered; while the first two have also disappeared, as many non-metals possess a metallic lustre and all are transparent if sufficiently thin. The 18th-century idea of the chemical nature was that they all consisted of a metallic calx united with phlogiston [PHLOGISTON], and it was left to Lavoisier to demonstrate their elementary nature. At present a complete definition to include all metals is difficult. They are best characterised as being elements the oxides or at least the lower oxides of which form bases capable of neutralising acids with the formation of salts.

Metamorphism is a term employed in geology for the various changes in texture which certain rocks undergo subsequent to consolidation. These rocks, which are termed *metamorphic*, may be originally either aqueous or igneous. The alteration they have undergone may consist merely in a rearrangement of their particles, or may involve partial or complete crystallisation or even the introduction of new substances into the rock. The production of cleavage (q.v.), by which clay is converted into clay-slate; and of foliation, by which granite may be changed into gneiss (q.v.), or diorite into hornblende-schist, are examples of the first of these modes of change. Marmorosis, *i.e.* the conversion of chalk into marble (q.v.); and the formation of *spotted slates* by the development of crystals of andalusite, chiastolite, etc., are examples of the second mode; and dolomitisation, *i.e.* the conversion of ordinary limestone into magnesian limestone, exemplifies the third mode of change. Such metamorphism as the first or second modes may be the result of pressure and the heat that pressure generates. Shale (q.v.) seems to have originated in part from vertical pressure, and the

direction of cleavage-planes points to cleavage as being generally the result of such tangential or horizontal thrust as would come in the general cooling of the earth's crust. Foliation and schistosity may be merely rearrangements of crystalline particles also due to such lateral pressure; but the development of scattered crystals in slate, and the formation of some marble from chalk, is often obviously the result, as at Rathlin Island, of the thrusting of molten igneous rock through rock not previously crystalline. Heat, however produced, seems sometimes to have reheated igneous rocks to such a point as to permit a rearrangement of crystals without actual fusion. The introduction of new substances into a rock cannot be explained by mere pressure or heat, but must be due to percolating water, mineral solutions or vapours, which sometimes accompany the thrusting in of molten igneous rock. Many metamorphic rocks, indeed, show signs of the combined action of all the various agents of metamorphism.

Metamorphosis, the change which many animals undergo during development, when an entirely different form is assumed; the butterfly is an example.

Metaphor, a rhetorical figure of speech by which the terms for expressing one idea are transferred in consideration of some analogy or similitude to the expression of another idea. The substitution may take place in the case of substantives, adjectives, verbs, adverbs, or phrases, and even of whole sentences or passages. Most ordinary vocabularies consist to a very large extent of expressions which once were metaphors. For instance an *expression* is a "squeezing out."

Metaphysics. This term, which originally meant "first philosophy," or the study of first principles, is due to Aristotle's treatises on this subject having been placed *after his physical treatises, meta ta physika*. The term now embraces the study of ontology and such psychology as is transcendental, *i.e.* goes beyond conclusions derived from experience, and also any studies pursued on transcendental methods. This use is partly due to the title *meta ta physika* being wrongly supposed to mean "beyond physics," "transcending physics."

Metastasio, PIERO BUONAVENTURA (1698-1782), an Italian poet much esteemed in the 18th century, was born at Rome of poor parents. His father's name was Trapassi; the name was Græcised by the poet's early patron, Gravina, the jurist. Metastasio made his reputation by a birthday ode, *The Gardens of the Hesperides*, written for the Empress Elizabeth Christina. This brought him to the notice of Bulgarini the singer, for whom he wrote his chief pieces, *La Semiramide*, *L' Artaserse*, *La Didone Abbandonata*. She left him her fortune, his claim to which the poet generously decided to forego in favour of her husband. In 1730 Metastasio was invited to Vienna and given the post of "poeta cesareo" by the Emperor Charles VI. Here he died, leaving a large fortune.

Metatheria. [MARSUPIALS.]

Metazoa, animals in which the cells are differentiated, *i.e.* all animals above the Protozoa (q.v.). [ANIMAL KINGDOM.]

Metellus. The name of an ancient Roman family of the Cæcilian clan. (1) LUCIUS CÆCILIUS was twice consul, and in 224 B.C. dictator. He won the battle of Panormus in the first Punic War, and in 241 B.C., when the temple of Vesta was on fire, saved the Palladium. For the latter service his statue was erected in the Capitol. He died in 221 B.C. (2) QUINTUS CÆCILIUS, surnamed NUMIDICUS, was the ablest of his family. Consul in 109 B.C., he had Numidia as his province, and carried on the war against Jugurtha. He headed the aristocratic party at Rome against Marius and Saturninus, and was expelled the senate in 100 and exiled to Rhodes. On his return to Rome he was received with enthusiasm.

Metempsychosis. [TRANSMIGRATION.]

Meteorology is a science which treats of atmospheric phenomena. When the phenomena are systematically observed in any place, the results may be generalised to give the climate of the place, a knowledge of which is of immense value in deducing the suitability of any country for the support of animal and vegetable life. A less systematic grouping of atmospheric phenomena is indicated by the term *weather*. This science of weather and climate cannot be considered exact. Of the upper layers of the air we know very little, and changes in the lower ones are dependent, to a great extent, upon local conditions such as proximity of large areas of water, or elevation of the ground. Thus, observations can only lead to the discovery of atmospheric law, when they are made in many places, over a long range of time, and are carefully compared together. Aristotle may be said to have been the first meteorologist, but nothing exact was done till the invention of the thermometer and barometer. In 1817 Humboldt's "isothermal lines" divided the globe into areas of equal temperature, and gave a first idea of the arrangement of the climates of the earth. This work on the temperature of different localities has been carried on ever since; but not till 1868 was anything definite done with regard to the pressure of the air and the connection between it and the prevailing winds of any locality. Next followed charts of the rainfall of different districts, the connection between it and the prevailing winds and contour of the districts being at once seen. Weather maps now occur daily in our newspapers, but they first appeared in 1858 in accordance with a suggestion of Le Verrier's. These weather maps, drawn up in different places, have been of immense practical advantage in enabling storms to be predicted. The study of meteorology may be divided into considerations of the temperature, pressure, humidity, and the electrical state of the air, together with a study of winds and rainfall. Under these chief heads will come, for example, registration of dew-point, description of clouds and thunderstorms, alteration of the position of a compass-needle, connection between magnetic disturbances and solar changes, and occurrence of

Auroras or Northern Lights. Meteorology owes much to observations made by *H.M.S. Challenger*.

Meteorites are small meteors (q.v.). They are popularly called shooting-stars.

Meteors, or FIREBALLS, are bodies which do not belong to the earth, but come from other parts of space into our atmosphere, and are seen as bright balls of fire crossing the sky, with a train of light behind. Suddenly they are seen to go out, and very often a fall of stones occurs. Sometimes they are observed to break in two, and loud explosions like thunder are heard. They move very fast—ten or twelve miles per second, and are visible when between 40 and 80 miles above the earth. Other meteors dart across the sky and disappear, all in a very short time. These are known as *shooting stars*, and are sometimes big and bright, like planets. It is estimated that about six or eight meteors which drop stones come into our atmosphere every year; but some 20,000,000 of small bodies pass through the air every day—these would all appear as shooting stars if they occurred at night. At some periods of the year there are so many shooting stars that they appear like a shower of fire. On November 14th this happens, the shower being greatest every 33 years. A stream of meteors is travelling round the sun, and every 33 years the earth just comes through them. Meteoric showers also occur about August 9th to 11th, and smaller ones in April. The luminosity of meteors is due to the intense heat caused by the resistance of the air to their passage, and in support of this theory it is found that meteoric stones are always covered, either wholly or in part, with a crust of cement that has recently been melted.

Methane, known also by the names *light carburetted hydrogen* and *marsh gas*, is the first member of the group of hydrocarbons known as the paraffins. It is a colourless, odourless gas, slightly soluble in water. If subjected to cold and pressure it may be liquefied. Its chemical composition is represented by the formula CH_4 , and its density is hence 8; or, if referred to air, .56. It burns with a yellowish flame, with the production of carbonic acid and water. In the neighbourhood of the petroleum wells of America and the Caucasus the gas escapes from the earth, and in some districts (Baku) has been kept burning for years as sacred fires. It is evolved as a product of the decomposition of vegetation, and is thus found in swampy and boggy regions. [MARSH GAS.] It is frequently found in coal-mines and known to the miners as fire-damp. As it forms an explosive mixture with air, its presence is a source of considerable danger in mines, and has been the cause of many fatal explosions. It is also of interest from the fact that the study of this and some allied hydrocarbons first led Dalton to the formulation of the atomic theory.

Methodists, the members of a number of religious bodies, which owe their name and, in most cases, much of their doctrine and practice to the society in the Church of England founded by John Wesley in 1729 at Oxford, joined by George Whitfield in 1735. From their rigorous attention

to the duties enjoined on Christians in the New Testament, and their devotion to good works, the unawakened members of the English Church called them *Methodists*, which title they adopted. Not being allowed to set forth their views in the pulpits of the English Church, the leaders took to open-air preaching, and then soon organised a Church on the plan of that of the Moravian Brothers, by whom Wesley had been much impressed in Georgia and Herrnhut between 1735 and 1737. At the outset the Methodists exhibited a division into Wesleyans, who held Arminian views, and Whitfieldians, who were Calvinistic. The special feature of Methodism was the promotion of strong religious enthusiasm and great missionary zeal. Since 1766 Methodism has flourished in N. America, where are many sects, some being, unlike the British sects, episcopalian.

Methyl is the name given to the group of elements or radical CH_3 , which exists combined with other elements in very many compounds, as *methyl chloride* (CH_3Cl), *methyl cyanide* (CH_3CN), etc.

Methyl Alcohol, also known as WOOD SPIRITS or WOOD NAPHTHA, is the first and simplest of the series of compounds known as alcohols, and possesses the composition CH_3OH . It is found among the products of the dry distillation of wood and from this source it is usually obtained. It is a colourless and mobile liquid, which has a specific gravity of .796, and boils at 66°C . It is very inflammable, and is used as a source of heat, and largely as a solvent for caoutchouc, gums, and other organic products. If oxidised, it behaves like other primary alcohols, yielding an acid—in this case *formic acid* (q.v.).

Methylated Spirit consists of ordinary alcohol to which has been added 10 per cent. of *wood spirits* (methyl alcohol, q.v.). It is then allowed to be sold duty free, and is hence much cheaper than pure alcohol. It cannot be employed in preparations of consumable articles, but is largely used as a solvent for gums, resins, etc.; as a preservative; for use in spirit lamps; and instead of alcohol for all purposes where the presence of the wood spirit is not objectionable. Strong representation made in 1853 to Government showing the desirability of allowing alcohol to be used duty free for manufacturing purposes, led to the introduction of methylated spirit.

Metre, in language, especially in song or verse and in music, is the rhythmic arrangement of syllables or notes in respect of time-length and stress. The term, with descriptive epithets, is used to indicate the particular rhythmic system on which a verse or stanza is constructed. For instance, in English hymnology *common metre* denotes a stanza or verse of four lines, the first and third lines containing eight syllables with stress on the even places, and the second and fourth of six syllables with stress on the even places. This metre is also called an *iambic* metre, because the lines can be divided into similar dissyllabic sets of syllables called feet, in which the ictus or stress falls on the second syllable. [IAMBICS, TROCHEES.] Song and dance originally went together, and the rhythm of verse corresponded to the rhythm or measure of

the movements of the feet in dancing or marching. In most ancient metres the rhythmic ictus generally fell on a long vowel, or a vowel followed by more than one consonant, so that the syllable was long. The ictus of simple metres was marked by the beat of the descending foot or *thesis*, with which alternated the lighter foot of the metre or *arsis* ("raising"); but Latin metricians inverted the use of these terms, and their example is generally followed. Except in a comparatively few special cases, a long syllable had double the time-length of a short syllable or *mora*. [IAMBIC, DACTYL, HEXAMETER, SPONDEES.]

Metre, originally intended to be $\frac{1}{10}$ millionth part of the earth's quadrant, and adopted as the standard of length in France. It is equal to 39.3708 English inches. [METRIC SYSTEM.]

Metric System is the modern French system of weights and measures. In 1790 the French Academy of Sciences appointed a commission to choose some scientific unit of length. They considered that $\frac{1}{10000000}$ of the earth's quadrant measured between the pole and equator would be both a convenient and natural unit. Measurements were made on the meridian through Dunkerque, and standards of the unit calculated from these measurements were made and deposited in the French archives. This unit was called the metre. Although more recent measurements of the earth's quadrant have differed somewhat from the previous one, the length of the metre remains unaltered. This, however, has caused it to become as arbitrary a unit as the English yard instead of a natural one as was desired. The metre is divided into decimetres, centimetres, and millimetres (1 metre = 10 decimetres = 100 centimetres = 1,000 millimetres). Its multiples are the decametre (100 metres), hectometre (100 metres), and kilometre (1,000 metres). All other units of weight and measure are based upon the metre; thus, the are (q.v.), the unit of land measure, contains 100 square metres; the litre (q.v.), the unit of volume, is a cubic decimetre; and the gramme (q.v.) is related to the cubic centimetre. The prefixes deca-, hecto-, kilo-, deci-, centi-, milli-, are used with the other units, as with the metre, to denote multiples and sub-multiples. It was sanctioned as the legal system of weights and measures in France in 1801, and is in general use for scientific purposes.

Metropolitan, in the Greek Church, a prelate corresponding with our archbishop, so called from *metropolis* ("a chief city"). The metropolitan ranks above a bishop, but below a patriarch, which title is only used in the Eastern Churches.

Metternich, CLEMENS WENZEL NEPOMUK LOTHAR, PRINZ VON, was born in 1773 at Coblenz. After studying at Strasburg and Mainz, he travelled in England and Holland, and on his return married as his first wife, the granddaughter of Kaunitz. He made his mark as a diplomatist at the Congress of Rastadt in 1798, where he represented the Westphalian nobles. His conduct of the negotiations with Prussia in 1803-5 further enhanced his reputation, and in 1806 he was appointed Austrian

ambassador at the Court of France. He succeeded in lulling Napoleon while Austria was preparing for the campaign of 1809, after which he became Foreign Minister and Chancellor. He now thought it necessary for the interests of his master that Maria Louisa should marry Napoleon, and for the next few years Austria occupied a strong position owing to his diplomacy. Metternich was now created Prince of the Empire. In 1826 he became Home Minister in Austria, and as such put down the slightest tendencies towards liberalism. After 1830 his influence outside Germany declined, though in Austria he continued his repressive policy; but in 1848 he was obliged not only to resign office but to leave his country. Till 1851 he lived chiefly in England and Belgium. He died in 1859.

Metz, one of the strongest fortresses in Europe, is situated on the Moselle about 30 miles N. of Nancy. Its name is supposed to be a corruption of *Mediomatrici*, the name of the tribe which inhabited the district. It was the capital of the Frankish kingdom of Austrasia, and in after years became a free imperial city. In 1552 it was seized by Henri II. of France, and in that year stood a siege from the Emperor Charles V. From the Peace of Westphalia (1648) till 1871 it remained in the possession of France. The fortifications were strengthened by Vauban in 1674 and restored in 1830, and the Germans have still further added to them. The Gothic cathedral of Metz is remarkable for its size and the beauty of its spire. [BAZAINE.]

Meung, JEAN DE (JEAN CLOPINEL), a French mediæval writer, was born at Meun-sur-Loire in the middle of the 13th century. He continued the *Roman de la Rose*, altering its tone from that of a poem to that of a contemporary satire. He also translated the New Testament into single-rhymed quatrains. He died soon after 1300.

Meursius, JOHANNES (JAN DE MEURS), a great Dutch scholar, was born near the Hague in 1579. After having been travelling tutor to the son of Pensionary Barneveldt, he became successively professor of history and Greek at Leyden, and historiographer to the States-General. In 1625 he was given the chair of history at Sorö in Denmark, where he died in 1639. His chief works were the *Glossarium Græco-Barbarum*, *Historia Danica*, and editions of *The Characters* of Theophrastus, *De Re Rusticâ* of Cato, and of several late Greek writers.

Meurthe-et-Moselle, a French department, deriving its name from the rivers which traverse it, has Germany as its eastern, and the departments of Vosges and Meuse as its southern and western, boundaries. There are valuable iron and rock-salt mines, and manufactories of woollen and cotton goods, of glass and of pottery. Corn and the vine are also grown. Nancy is the capital, Toul and Lunéville being the other chief towns.

Meuse. 1. A river (called also MAAS), rises in France, in the department of Haute-Marne, flows northerly into Belgium, turns east at Namur, and, after another northerly course, finally bends westerly and joins the Waal, one of the mouths of the Rhine. When the stream again divides, the

northern part is called the Old Maas. The New Maas is the name given to the lower waters of the Lek, from Rotterdam downwards. It is connected with the Old Maas by a canal. The total course of the river is about 500 miles; it is navigable from below Verdun. The chief towns on its banks are Sedan, Namur, Liège, Maestricht, and Rotterdam.

2. A department in north-eastern France, on the Belgian frontier, having Meurthe-et-Moselle on the east, and Marne and Ardennes on the west. It has an area of 2,404 square miles. From its fertile soil much wheat and beet-root are produced, and the vines yield wine. There are also iron-mines and manufactures of glass and paper. Bar-le-Duc is the chief town, Verdun and Montmédy being the largest of the others.

Mexico, a country in the south of North America, consisting of 27 states, 2 territories, and the federal district of Mexico, the total area of the whole amounting to 751,177 square miles. The territory of Lower California is separated by the Gulf of California from the main body of the country, the S.E. limit of which (the peninsula of Yucatan) points north into the Gulf of Mexico.

History. The earliest known inhabitants, the Toltecs, were a highly-civilised people, who left splendid memorials of their skill in temples and monuments, the ruins of which are still to be seen. They were nearly exterminated by a pestilence in the 11th century, and were succeeded by ruder races, first the Chichimecs, and secondly the Aztecs, whom Cortes in 1519 found in possession of the land. In 1540 Mexico was united with other parts of America to form New Spain. For nearly three centuries it continued to be the chief Spanish possession, and was used simply as a great mining estate. After several abortive rebellions, the city of Mexico was taken from the Spaniards in 1821, and soon afterwards the republic of Mexico was founded under the auspices of Santa Anna (q.v.). Half a century of civil wars followed, during which Texas and another portion of Mexican territory were added to the United States. In 1861 England, Spain, and France had to interfere to protect the interests of their subjects, and Napoleon III. subsequently attempted to force the Archduke Maximilian (q.v.) upon the country as ruler. After his downfall, till the year 1871, Juarez (q.v.) was absolute in Mexico. On his death there was another period of strife, the end of which was the election of the able General Porfirio Diaz in 1876 as president. Diaz was re-elected in 1884, and again in 1892.

Physical Features. The greater part of Mexico consists of an elevated table-land, sloping gradually to the Pacific, and sharply to the Atlantic coast. The principal range of mountains is the Sierra Madre. The chief peaks in Mexico are Nevado de Toluca (19,454 feet), in the Cordillera de Anahuac, and Popocatepetl (17,523), to the south-east of the capital. The last volcanic eruption was the upheaval of Jorullo in 1759. The Rio Grande del Norte separates with its stream Mexico and Texas. Several of its affluents water northern Mexico; but there are few other streams of any importance, and only one or two lakes of any size. On the plateau

the climate is that of perpetual spring; in the N. and N.W. there is very little rain. On the coast the climate is more variable. The only harbour of much utility is that of Acapulco on the Pacific coast. The soil is fertile, yielding maize, wheat, and several fruits; the forests, especially on the coast of Campeachy Bay, produce valuable timber.

Products, Trade, etc. The first cattle-ranches were established in Mexico, and in the north most of the inhabitants, besides foreign settlers, are engaged in this industry. The vine is also cultivated in Coahuila province and near El Paso. Agriculture, however, is hampered by want of water and distaste for the use of machinery. The labourers consist of semi-servile Indians. The silver mines of Mexico have always formed her chief wealth. Gold and copper are also obtained. The coal mines are as yet little worked. Pulque (a drink) is made from the Mexican aloe, and the woollen and cotton industries are encouraged by protective duties. The Mexican slouch hat or *sombrero* is largely made. Foreign trade is almost entirely with the United States and Great Britain. A large proportion of the exports consists of gold and silver, the rest being flax, hemp, sugar, hides, and timber. Railways and telegraph lines are of very recent introduction, and the roads are bad.

Social and Political Facts. Education is very backward, less than 10 per cent. of the people being able to read and write. There is no established religion, but most Mexicans are Roman Catholics. As late as 1889 sun-worshippers were to be found in the province of Chihuahua. The external public debt was converted in 1890, and in 1891-92 for the first time expenditure fell beneath revenue. An enormous proportion of the latter goes to pay the fiscal gendarmerie. In spite of them and their exactions, Mexican trade is increasing.

MEXICO, the capital of the federal republic, is situated at a height of more than 7,000 feet above the sea-level, some 200 miles from Vera Cruz, in Campeachy Bay. It was founded by the Aztecs about 1325 in a district which was then covered with lakes. The chief building is now the cathedral, begun by the Spaniards in 1573 and completed at immense cost 80 years later. It contains the famous calendar stone. Beautiful paved roads, with double rows of trees, leading into the country on every side, form a picturesque feature of the place, which would be very unhealthy but for the dryness of the atmosphere. Many attempts have been made to drain the valley; the last, begun by English enterprise in 1890, has promise of success. The trade of the city is as yet not very important.

Mexico, THE GULF OF, a part of the Atlantic Ocean which is enclosed by Mexico, the southern states of the Union, and the northern West India islands. Between Cuba and Florida through the Florida Channel flows the Gulf Stream; and the former is separated from Yucatan by the Yucatan Channel, nearly 200 miles broad. The central parts of the gulf are deep, but the shore waters rather shallow. Strong N.E. gales blow across it from September to March. There are few good harbours, the coasts being lined generally by

lagoons. The Mississippi enters the gulf near New Orleans.

Meyerbeer, GIACOMO, the operatic composer, was the eldest son of Herz Beer, a wealthy Berlin banker of Jewish extraction. The name Meyer was afterwards prefixed from that of a benefactor. The date of his birth is probably 1791, but is sometimes given as 1794. At the age of seven he played in public Mozart's *Concerto in D Minor*, and he won his earliest laurels as a pianist. His *Crociato*, produced with great success at Venice in 1824, was his first work of any merit. In 1831 was given *Robert le Diable* with words by Eugène Scribe. It was followed in 1836 by *Les Huguenots*, soon after the production of which the composer became kapellmeister to the king of Prussia. *Le Prophète*, given at Paris in 1849, was the last of Meyerbeer's best works; *L'Étoile du Nord*, a comic opera; *Le Pardon de Plöermel* (or *Dinorah*), *L'Africaine*, are others of his works. He died in 1864.

Mezquit (*Prosopis glandulosa*), a leguminous tree, allied to the Mimosas (q.v.), native of Texas. It grows 30 feet high, with hard, durable wood; bi-pinnate, glaucous leaves; small, yellowish flowers, sessile in little heads; and indehiscent pods. The tree yields much valuable gum allied to gum-arabic. *P. pubescens*, the screw-bean, so called from its twisted pods, in Texas, New Mexico, and California, *P. dulcis*, the South American algarobo (the sweet pods of which are used for cattle food), and *P. juliflora*, of Jamaica, also yield gum mezquite.

Mezzotint, a method of engraving on steel or copper. First the whole surface of the plate is roughened, and then the roughness is lessened or removed for the lighter parts of the engraving. This process was invented (1643) by Van Siegen, a Dutchman. Its great drawback is that it does not allow of sharp and clear delineation of form.

Miall, EDWARD (1809–81), a prominent advocate of disestablishment, was a Nonconformist minister for several years. In 1841 he began to conduct the *Nonconformist*, and three years later was the chief founder of the British Anti-State-Church Association. From 1852 to 1867 he was M.P. for Rochdale, and from 1869 to 1874 for Bradford. He was author of *Title-deeds of the Church of England to her Parochial Endowments* (1861).

Miao-tze, a term applied by the Chinese in a general way to the semi-civilised hill tribes of the south-western provinces. They are numerous, especially in the Nan-Shan uplands about the frontiers of Kwang-si and Kwei-Chew, where they form autonomous communes in territory assigned to them by the Emperor Yung-Ching in 1730. Mention occurs of independent Miao tribes speaking distinct languages (probably Shan dialects), as early as 800 B.C., in which year an expedition was sent to drive them out of the province of Hu-nan. In his expedition of 1861 up the Yang-tze-Kiang Captain Blakiston met some of these Miao—a word in Chinese meaning “aborigines”—whom he describes as of quite a different type from the Chinese, with straight eyes, large nose, dark complexion without the least shade of yellow. But

descriptions vary with every group visited by travellers, so that no definite ethnical meaning can be attached to this term.

Mias. [ORANG.]

Mica is the name given to a group of silicates differing much from each other in chemical composition and optical properties, but having as a common character an easy cleavage in one direction, and thus affording plates remarkably thin, transparent, tough, flexible, elastic, and pearly. They are mostly silicates of aluminium and potassium, but also contain magnesium, iron, lithium, etc., and a little water. Their hardness ranges from 2 to 3, and their specific gravity from 2.7 to 3.1. They probably all crystallise in the Prismatic system, but occur in six-sided tabular crystals, some of which have clearly two optic axes, whilst others appear uniaxial, the two axes being not recognisably divergent, whence these forms were supposed to belong to the Hexagonal system. *Muscovite*. *Muscovy glass*, common, white or potash mica, is distinctly biaxial, and is a very common mineral, occurring in granite, gneiss, mica-schist (q.v.), and some sandstones. Plates sometimes more than a yard across are obtained in Siberia, Scandinavia, Canada, the United States, and Peru. It is used as a covering for gas-lamps, lanterns, and stoves, or even instead of window-glass. *Biotite*. black magnesia, or uniaxial mica, named after the French mineralogist Biot, also occurs commonly in igneous rocks. *Lepidolite*, lithia-mica, is a rose-pink or lilac mineral in pearly scales, whence its name (Greek *lepis*, “a scale”), giving the characteristic lithia red tint to the blowpipe flame. In retail trade muscovite is often erroneously called talc (q.v.).

Micah (“who is like unto Jah”), one of the minor prophets, contemporary with Isaiah, prophesied in the reigns of Jotham, Ahaz, and Hezekiah.

Mica-schist, a rock composed of quartz and mica foliated. The mica being in thin sheets causes the rock to split readily or be *schistose*. The mica is usually muscovite, but sometimes biotite. Garnet is a common accessory mineral; tourmaline and felspar less so. By addition of felspar it merges into gneiss. It sometimes appears to show traces of current-bedding and other indications of being originally sedimentary. It occurs in round granite bosses as a metamorphic zone, a mile or so broad, shading into slate or greywacke, and evidently due to contact-metamorphism; but it also forms vast regions in Norway, Scotland, the Alps, and elsewhere, of Archæan age, but not so clearly metamorphic in origin.

Michaelis, JOHANN DAVID (1717–91), a learned biblical scholar, was the son of JOHANN HEINRICH (1668–1738), director of Francke's “Collegium Orientale Theologicum.” After travelling in England and Holland, he became *privat docent* at Göttingen, where he was afterwards professor of philosophy and Oriental languages for half a century. He translated the Bible and part of *Clarissa Harlowe* into German, and was the author of several exegetical and historical works relating

to the Hebrews, some of which have been rendered into English.

Michaelmas, a festival observed by the Anglican, Roman Catholic, and other churches on September 29, in celebration of St. Michael and All Angels. In England September 29 is one of the quarter-days on which rents are paid.

Michelet, JULES (1798-1874), was appointed in 1821 to a mastership at the Collège Rollin. In 1827 he became *maître de conférences* in the École Normale. His abilities and revolutionary opinions gained him a place in the French Record Office, and the post of assistant-professor to Guizot in 1830. Eight years later he was named professor of history in the Collège de France, a post held by him till 1852, when he refused to take the oaths to Napoleon III. He died at Hyères. The great work of Michelet's life was his *Histoire de France*. It was continued by a *History of the French Revolution* (of little value), and the beginning of a *History of France in the 19th Century*. Michelet also produced several studies, such as *Le Procès des Templiers*, and *La Sorcière*, numerous pamphlets against the Jesuits, *Du Prêtre de la Femme, et de la Famille*, and some popular books on natural history.

Michigan, one of the United States of America, is divided from Canada by Lakes Superior and Huron, and from Wisconsin by Lake Michigan. On the south and south-east are Indiana, Ohio, and Lake Erie. Its area is a little more than that of England and Wales, much the larger part of which is the southern of the two peninsulas which make up the state. The surface of the state is generally flat, but in the northern peninsula there is a range of hills, the highest point of which reaches 1,800 feet. This upper part is, generally speaking, rocky and barren, but rich in minerals; in the lower, wheat and other cereals, and in the western part fruits are grown. The copper mines of Keweenaw, the extreme northern part of Michigan, are the best in the world; in the centre of Lower Michigan coal is found in abundance, but not of good quality. Most of the iron comes from Marquette county, and of the gypsum from Grand Rapids. Small quantities of gold, silver, and lead are also found in the upper peninsula. Salt and timber come after copper and iron as the chief products of Michigan. Building and other stones abound, and there are several mineral springs. The commerce of Michigan is conducted by means of three ship canals, two of which are on the neck of land between Lakes Superior and Huron, and the other on the Keweenaw peninsula. Much wool is sent to market. Michigan is divided into 84 counties, the chief towns being Detroit, Grand Rapids, Saginaw, Bay City, and Lansing, the capital. The state university is at Ann Arbor; the state prisons at Jackson and Marquette. Education is in an advanced state, and there are many technical schools.

Michigan, LAKE, a long piece of water between Wisconsin and Michigan, joins Lake Huron between St. Ignace and Mackinaw. The name, which is Indian in origin, and means "Great Lake," was at first applied both to Huron and

Michigan, as they properly form but one lake. Michigan proper is 335 miles long, and varies from 50 to 90 miles in breadth. On the low shores are numerous lighthouses, and there are several harbours on the western coast. Mean depth of lake 325 feet.

Mickiewicz, ADAM (1798-1855), the poet of Poland, was born in Lithuania. His first volume of poems was published in 1822, and was succeeded three years later by a series of sonnets on the Crimea. In 1829 appeared *Konrad Wallenrod* and *Grazyna*, the subject of which was the struggle between the Lithuanians and the Teutonic Knights. The first was translated into English in 1841. *Pan Tadeusz* appeared in 1834. In 1840 Mickiewicz became professor of Slavonic literature at Paris; but he was unable to refrain from giving utterance to his political views, and was therefore deposed in 1843. Before his death he returned to Paris (where his collected works were first published in 1861), to become librarian to the Arsenal Library on the nomination of Louis Napoleon. He died at Constantinople, whither he had gone to organise a Polish legion—a service he had formerly performed in Italy.

Micmacs, North American Indians, formerly scattered chiefly along the coastlands of Nova Scotia, New Brunswick, Gaspé (Lower Canada), and in Prince Edward Island. The name appears to be a corrupt form of *Micwak* or *Micwanak* ("people of the west"), an expression applied generally to the Indians of Gaspé by the more easterly Cape Breton people. They are a branch of the Algonquian family, forming with the neighbouring and allied Miliceets the Souriquois nation, faithful allies of the French during the colonial wars. The Micmacs still number about 4,100, living as fishers and hunters chiefly in Nova Scotia and New Brunswick, and nowhere confined to reservations. Some are educated and are credited with possession of a peculiar alphabet or script of unknown origin.

Microbe. [BACTERIA.]

Microcline, a potash-felspar, or mineral silicate of aluminium and potassium, crystallising in the Anorthic system, but with one of its crystallographic axes so slightly inclined (whence its name) as closely to resemble orthoclase. Amazon-stone is a green variety of it.

Microcosm, "a little world," something representing, or supposed to represent, the idea of the universe, applied to man regarded as an epitome of the world; also used by Disraeli for a small society.

Microcosmic Salt, a salt which consists chemically of the acid phosphate of sodium and ammonium ($\text{H}\cdot\text{Na}\cdot\text{NH}_4\text{PO}_4 + 4\text{OH}_2$). It forms transparent, monoclinic crystals, soluble in water, and possessing a saline taste. If heated, they melt, and, giving off water and ammonia, become converted into acid sodium phosphate. It is employed as a blowpipe reagent in chemical analysis. It received its ordinary name from the fact that it is a product of the human economy and is found dissolved in the urine.

Microlepidoptera, a group of moths, including several different sections united together owing to

their small size. The Grass-moths (q.v.) or *Crambida*, the Tabby House Moth (*Aglossa pinguinalis*, Linn.), and Meal-worm (q.v.) are familiar types.

Microlithic. [MEGALITHIC.]

Micrometer is an instrument used for the accurate measurement of small lengths or angles. The vernier (q.v.) and spherometer (q.v.) are examples of such instruments. The micrometer screw is one of the most important forms; it consists of an accurately-cut screw, the distance between two consecutive threads being very small—often $\frac{1}{50}$ of an inch. A large, carefully-graduated round head is fixed to the screw; so by giving this head a complete turn, the end of the screw advances $\frac{1}{50}$ of an inch. If the circular scale on the head is divided into, say, 20 parts, by moving it only through one division the end of the screw will advance $\frac{1}{1000}$ of an inch. The micrometer screw is attached to very many physical instruments, especially those used in optics, the micrometer microscope being one of the most delicate of measuring instruments. Telescopes are often provided with a tube across the end of which are stretched two parallel fine threads. These are movable by a micrometer screw, and enable astronomers to find the apparent distance between two stars which are very near to each other.

Micronesians, the natives of the Pelew, Marianne, Caroline, Marshall, and Gilbert archipelagoes (Micronesia), who belong fundamentally to the brown Polynesian race, but have been modified in diverse ways by intermingling with Malays, Papuans, Philippine islanders, Japanese and Chinese. Hence there is no particular Micronesian type, the colour varying from light brown or olive to a deep mahogany. the stature from below the medium height to five feet ten inches and even six feet; but the hair is almost uniformly black and long, and all the groups speak dialects of the Malayo-Polynesian language.

Microphone is an instrument for magnifying faint sounds, invented by Hughes in 1878. It depends upon the fact that if two conductors of electricity are in loose contact, any alteration of pressure at this contact will alter the resistance and therefore increase or diminish the electric current. Suppose a carbon pencil loosely touches two carbon blocks which are in circuit with a battery and a telephone, the carbons being fixed to a sounding board: any sound, however faint, is due to vibrations of the air: these vibrations are communicated by the board to the carbon blocks, so that the pressure between them and the pencil is constantly changing. The variation of the current so caused sets up vibrations in the telephone, where the original sound is heard in increased intensity. By this means even the foot-fall of a fly may be rendered audible.

Micropyle (from the Greek *mikron*, "small;" *pulon*, "a door") is the name of the opening left at the distal end of the ovule in seed-bearing plants when the coats of the ovule (primine and secundine) grow up over it. The outer opening, through the primine, which is sometimes the wider, is

known as the *exostoma*; the inner, through the secundine, as the *endostoma*. Through the micropyle the pollen-tubes pass in the process of fertilisation in angiosperms; but in gymnosperms the pollen-grain itself falls into the micropyle, where it is retained by a secreted drop of honey. The micropyle persists through the various changes of the coats until the seed is ripe, when it may be visible to the naked eye or can be easily detected by soaking the seed and then squeezing it, a jet of water issuing from it. In the sprouting of the seed the radicle or primary root first finds its way out through the micropyle.

Microscope is an instrument which magnifies the size of an object so that things often invisible to the naked eye are rendered large and distinct by its aid. In its simplest form it consists of a single convex lens, either provided with a handle for ordinary use as a reading-glass, etc., or mounted on a stand, where it can be adjusted by suitable means till it is in the correct position for viewing an object. A simple microscope of very high power is obtained when the lens is part of a glass sphere around which a deep groove has been cut and filled up with black matter. In the *compound microscope* an inverted image of the object is formed by a lens or group of lenses, known as the object glass, and this image is viewed by the observer through another lens or group of lenses called the eye-piece. Below the object-glass is the stage upon which the object is placed. A hole in the centre of the stage allows light to be reflected from a mirror below, through the object if it is transparent, so that it may appear brighter. If the object is opaque, light is made to fall on it by means of lenses above. The instrument is generally focussed by first moving by hand the tube containing the object-glass and eye-piece, and then making a fine adjustment by means of a screw. The power of a microscope is altered by changing either the object-glass or the eye-piece, and larger instruments are provided with more than one of each.

Microspore, the small or male spore in the heterosporous Pteridophyta (q.v.), such as *Selaginella* and the Rhizocarps (q.v.), in which there are two kinds of spores. The microspores are small and generally unicellular, resembling pollen-grains in structure, though not in function. They germinate, each producing a small and simple male prothallium and antheridium.

Microtome, THE, is an instrument for cutting sections of specimens to be observed under the microscope. It consists essentially of a holder for the specimen, and a rest for the razor. As a rule, the razor moves along the rest to cut the specimen, which is usually either frozen or hardened by some liquid such as alcohol, but sometimes it is the specimen which is moved against the razor. After the first cut, the specimen holder is raised by a micrometer screw through a distance equal to the thickness of the required section and another cut is made by the razor. By this means a section of uniform thickness is obtained. Microtomes may be obtained which are quite simple in construction;

while others are of the most complicated design, and are provided with many adjustments. Consequently they vary enormously in price.

Midas, a king of Phrygia, who in return for a service done to Silenus, was granted the power of changing everything into gold by his touch. Finding the boon somewhat of a burden, he bathed in the waters of Pactolus in order to rid himself of it. Gold washings are now found in the bed of this stream. Among stories related of him is the one of his being given ass's ears by Apollo because in a flute contest he decided in favour of his rival Pan.

Middleburg, a town in the island of Walcheren, and capital of the province of Zeeland in Holland. The town-house contains statues of 25 counts and countesses of Holland and Zeeland, and the museum of the Academy of Sciences one of Lipperskey's earliest telescopes. The 12th-century abbey has been metamorphosed into offices. The town was once one of great commercial importance, and its cotton-factories are still noteworthy.

Middlesborough, a manufacturing town and port in the North Riding of Yorkshire, is situated at the mouth of the Tees, eight miles below Stockton. By the discovery in 1850 of iron-ore in the Cleveland hills it was changed from a small town to an important manufacturing centre, the seat of the Cleveland iron district. Besides this it has large ship-building yards and docks, and exports coal in great quantities, and in recent years salt-boring has become an important industry. By the Reform Bill of 1867 Middlesborough became a parliamentary borough. In 1889 a town-hall and municipal buildings were opened. The Albert Park was given by the first mayor and member, Mr. H. W. Bolckow, to whom a monument was unveiled in 1881.

Middlesex, one of the southern counties of England, has Hertfordshire on the north, Essex on the east, Buckinghamshire on the west, and Surrey on the south. It was the country of the middle Saxons, lying between Essex and Wessex, but was never an independent kingdom. From 1101 until 1888 the county belonged in theory to the city of London, whose mayor was its lord-lieutenant. The surface is gently undulating, with no river except on its eastern, western, and southern boundaries. The larger part of the land is under pasture; the rest consists chiefly of parks and market-gardens. Brentford, Uxbridge, Hounslow, and Harrow are the only towns of any size, but there are many large villages. Near Barnet, in the north, was fought the battle of 1471, in which Warwick fell. The population is very dense, especially in the neighbourhood of London, which now forms a separate "county."

Middleton, CONYERS (1683-1750), the earliest of clerical rationalists, was born at Richmond, Yorkshire, and in 1706 became fellow of Trinity College, Cambridge. In 1722 he was appointed university librarian, and afterwards held the living of Hascombe, Surrey. His chief works, besides an able *Life of Cicero* (1741), were the *Introductory Discourse* and *Free Inquiry* well known to readers of Mr. Leslie Stephen and Mr. Lecky.

Middleton, THOMAS, English dramatist, was born about 1570 in London, and died in 1627. In 1620 he was appointed City Chronologer, in which office he was succeeded by Ben Jonson; and he frequently wrote for and arranged the city pageants. He wrote both tragedies and comedies, frequently, as was then the custom, in collaboration. *The Roaring Girl* (1611) was written with Dekker; *A Fair Quarrel*, *The Old Law*, and many others with Rowley; while Jonson and Fletcher may have had a hand in *The Widow*. Some of the most popular were *A Mad World, my Masters*, *The Mayor of Queenborough*, and *A Trick to catch the Old One*: but the posthumous plays, *The Changeling*, *The Spanish Gipsy*, and *Women, beware Women*, are probably the best. A play directed against the Spanish marriage produced in 1624, and called *A Game at Chess*, took the public by storm, but was interdicted by the authorities, and the author was summoned before the Privy Council.

Midianites, the descendants of Midian, fourth son of Abraham by Keturah. The Midianites dwelt in the land of Moab (Arabia Petrea), and were engaged from early times in commerce with Egypt. They were exterminated by Moses, because the women entered the Israelitish camp and seduced the Israelites.

Midshipman, a young gentleman who, having been a cadet, is in the further process of training to become a commissioned officer in the Royal Navy. His next step in promotion is to the rank of sub-lieutenant. He receives pay at the rate of 1s. 9d. a day, and is nominated by an order, not by a commission or warrant. To qualify for promotion he must, in addition to having passed his examinations, be 19 years of age and have completed five years' service.

Mieris, a family of Leyden painters, of whom FRANS VAN MIERIS (1635-81) was the best. He had many patrons, including Cosmo III. of Tuscany and the Elector-Palatine, and rapidly grew wealthy. His pictures are small and polished, but have not the softness of his master, Gerard Dow. WILLIAM, his son (1662-1747), imitated his father, as did also other members of the family.

Migne, JACQUES PAUL (1800-75), a Catholic priest, born at St. Flour, established near Paris in 1836 a great publishing-house, from which issued *Collection des Orateurs Sacrés* (100 vols.), *Patrologia Cursus Completus* (221 volumes in the Latin series, and 162 in the Greek), and the *Encyclopédie Théologique*, which appeared between 1846 and 1866 in 171 volumes. The Archbishop of Paris forbade the continuance of the undertaking, and a great fire in 1868 effectually carried out his orders.

Mignet, FRANÇOIS AUGUSTE (1796-1884), a great French historian, was a native of Aix in Provence, where he studied law with Thiers, and was called to the bar at the same time. Three years later he came to Paris, where he lectured at the Athénée, and wrote for the *Courrier Français*, and afterwards for the *National*. In 1824 was published his brilliant short *History of the French*

Revolution, which exerted great effect upon the public mind, and won for its author after the Revolution of July, 1830, the post of keeper of the archives at the Foreign Office. He retained the position till 1848, when he was deposed by Lamartine, and retired into private life. In 1833 Mignet visited Madrid on a secret mission, and the result of his inspection of the Simancas archives was *Négociations relatives à la Succession d'Espagne sous Louis XIV., Charles Quint, La Rivalité de François I^{er} et de Charles Quint*, and other valuable works. In 1851 he published his *Histoire de Marie Stuart*. He was elected to the Académie Française in 1836.

Mignonette (*Reseda odorata*), a herbaceous, sweet-flowered plant, native to Syria and north Africa, introduced into English gardens from France in 1742. It has dense, terminal, bracteate racemes of small flowers, each of which has generally six green sepals, and as many petals, below a relatively large and one-sided disk. The posterior petals have a concave greenish claw and a white limb cut into a tuft of club-shaped segments; but the anterior ones are more reduced, having often only one such segment. On the disk are the numerous stamens, with brownish red anthers, which give a colour to the whole inflorescence. The ovary is one-chambered, but made up of three carpels, which separate at the top at an early stage. The fruit is a many-seeded capsule. Though naturally an annual, and liable to be killed by autumn frosts, by removing its flower-buds the development of mignonette can be so prolonged that it becomes a perennial known as *tree mignonette*. The flowers are not beautiful, but are valued in gardens for their extreme fragrance. Two British species of the same genus—which is the type of a small order of Thalamifloræ (q.v.)—*R. lutea*, the wild mignonette, and *R. Luteola*, weld or dyer's-greenweed, once used as a dye, have scentless flowers.

Migration, the term applied by naturalists to the periodic movements of birds. Sometimes it is used in a wider sense, so as to denote the wanderings of other animals, as the movements of fish to deposit spawn, the journeys of reindeer in search of food, the descent of wolves in winter from mountains and hill-regions to the plains, and to the march of lemmings at irregular intervals southwards to the sea, from which none ever return. But Wallace, while citing these and similar instances, restricts the expression to the movements of birds, with a possible exception in favour of fishes. The phenomenon has been known from the earliest historic times, and in the oldest literature references to it occur. But the times of migration differ in various countries, as do the migrants themselves. In England, for example, flocks of birds arrive in the spring from the south, pass the summer with us, building their nests and rearing their young, and take their departure again in the autumn. The swallow, the warblers and the chats, and the cuckoo are familiar examples. To a second class belong those birds who leave their

breeding-places in regions to the north of us, driven southwards by the approach of arctic or sub-arctic winter. These arrive on our shores in the autumn, and leave us in the spring. Among such are the fieldfare, the redwing and the woodcock. To a third class belong those birds—the sandpipers, for example—which stay with us for a short period in their northward journey in the spring, and their southward return journey in the autumn; and to these the term “birds of passage” is properly applied. In the southern hemisphere the movements are reversed, and migration is southward in spring and northward in autumn. Besides the movements from continent to continent, there are others of limited range; and to those occurring at irregular intervals the term “irruptions” has been applied—*e.g.* to the visits of the sandgrouse, whose home is in central Asia, to Europe and Britain in 1859, 1863, and 1888. Many theories have been proposed to account for the fact of migration. That most generally accepted was put forward by Wallace. He, of course, put on one side the idea of “unerring instinct;” for, though birds follow determinate routes, numbers lose their way and perish. He puts the case of a species in the remote past, in which the area suitable for breeding and the area in which sufficient food could be found were at first the same, but which, owing to geological and climatic changes, gradually diverged from each other, and believes that the habit of incipient and partial migration at the proper seasons would at last become hereditary and so fixed as to be what is called an instinct; and that when the natural history of a sufficient number of species is worked out, we may find every link between species in which the two areas are coincident to those in which they are absolutely separated (*Nature*, x. 459). This divergence of breeding and subsistence areas with regard to the migratory birds of Europe probably took place in the Ice Age, and this view is supported by the fact that prior to that period mammals now found only in regions much farther south ranged over Europe, with which Britain was then connected.

Miguel, DOM MARIA EVARISTO (1802–66), the Portuguese usurper, was a younger son of King John VI. In 1824, in conjunction with his mother, he plotted the overthrow of the constitution, and arrested the ministers; but the king being supported by England, Miguel was banished. Two years later, when he was made regent for his niece Maria, he renewed his intrigues, and by the help of the Absolutist party was made king in 1828. In 1832 he was driven from power by English help, and never again appeared in Spain, where he was hated for his tyranny and dissoluteness.

Milan (MILANO, a contraction of MEDIO-LANUM), a historic city of Italy, stands on the small river Olona, 25 miles south of Lake Como. In 222 B.C. the Romans took it from the Insubrian Gauls. It afterwards suffered much from the barbarians, being sacked by the Huns in 452 and by the Goths in 539. It was next in the possession successively of the Longobardi (or Lombards) and

the Franks, and then passed under the sway of the emperor. The citizens, under their archbishop, stoutly resisted their feudal neighbours, and in the 11th century headed a league of Lombard towns against the Emperor Frederick I., who razed the city to the ground. Milan also took part with the Guelfs against Frederick II. In 1262 Otho Visconti, the Archbishop, obtained the lordship for his family, who held it with but a short interval for nearly two centuries. The lordship next passed to the Sforzas, the first of whom had married Bianca Visconti. They alternately opposed and became tributary to the French and

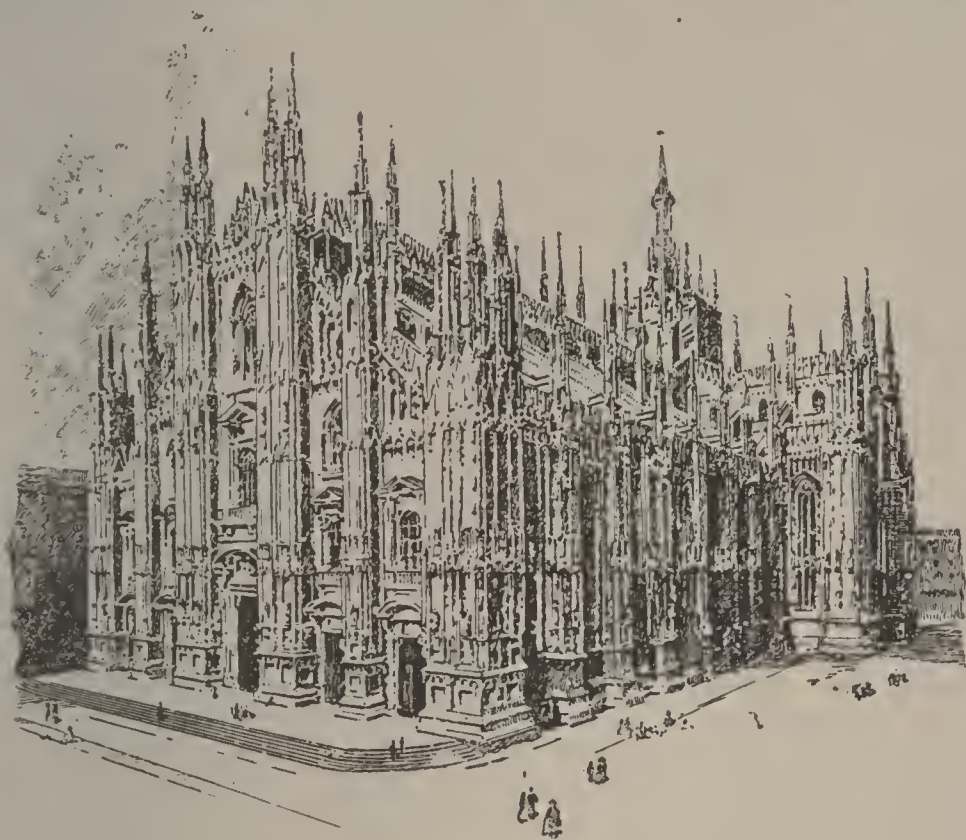
principal industry being the silk manufacture. Mulberry-trees for feeding the silkworms cover the surrounding plains. It is also a city of printers. The Galleria Vittorio Emanuele, an avenue roofed with glass, is one of the finest promenades in Europe. In population Milan is the second city of Italy. It has numbered among its citizens, besides St. Ambrose, Beccaria and Manzoni.

Mildew, the name popularly applied to various fungi, either parasitic upon higher plants or saprophytic upon damp paper, linen, etc. The chief are the *vine-mildew* and the *corn-mildew*—the former,

Erysiphe (formerly *Oidium*) *Tuekeri*, consisting of a white "mycelium," or "spawn" of fine threads covering the leaves and young fruit, sending suckers, or "haustoria," into the plant, and bearing also ascending stalks, each ending in an oval "spore" (q.v.). Corn-mildew (*Puccinia graminis*), belonging to a distinct order of Fungi, the *Æcidium*mycetes, is a remarkable example of "heteroecism," living, that is, parasitically on more than one host plant. On straw or dry grasses in autumn it appears as narrow black lines, which under the microscope are seen to consist of a mass of two-celled spores, each terminating a hypha or thread of spawn. In spring each of these *teleutospores* ("last spores"), as they are called, puts out a short tube or thread, termed the *promycelium*, bearing on its branches several minute cells or *sporidia*. These will only germinate on the leaves of the barberry, which they pierce and fill with *mycelium* ("spawn"). This mycelium bears flask-shaped bodies called *spermogones* on the upper surface of the barberry leaf, which are filled with small oval bodies, called *spermatia*, of unknown function, but possibly male. Through

the under surface of the barberry leaf there burst from the same mycelium numerous round orange-coloured bodies which spread into small cups, known as *cluster-cups* and filled with chains of spores. These cluster-cups were formerly known as *Æcidium berberidis*, and their spores are termed *æcidiospores*. These spores will only germinate on the leaves of some grasses, filling them with mycelium and bursting through their surfaces in a mass of oval, brown, one-celled spores known as *Uredo-spores*, formerly considered a distinct fungus, *Uredo segetum*. These spores can infect other grasses, giving rise on them to mycelium bearing similar spores; but late in summer, among the *uredo-spores* and on the same mycelium, appear the black, two-celled *resting-spores* or *teleutospores*, already described, which live through the winter and start the fresh cycle of generations.

Mile, a measure of distance first used by the Romans. The word, etymologically, means "a thousand" (paces of a Roman soldier). It is used to designate a number of lengths varying from the Saxon mile of 9,913 complete yards to the Greek mile of 1,412 complete yards. The old Roman



MILAN CATHEDRAL.

the emperor, who each claimed the Milanese. From 1535 till the Peace of Utrecht the territory was a dependency of Spain. It then passed to Austria, which was deprived of it for a time by Napoleon, but again held it till at the Peace of Villafranca it became part of Piedmont. In 1848 Milan had led the Italian struggle for liberty. The city stands in a fertile plain, and is built in a circle, with the splendid marble cathedral in the centre. This was begun under Gian Galeazzo Visconti in 1386, and was completed under the Napoleonic régime, but still undergoes alterations from time to time. It is the third largest cathedral in Europe. Other interesting churches are those of St. Ambrogio and Santa Maria della Grazie. On the refectory walls of the monastery to which the latter belonged, Leonardo da Vinci's great picture was painted. Chief among the modern buildings are the Della Scala opera house, one of the largest in Europe, and the Great Hospital, which will hold more than 2,000 patients. The Brera Picture Gallery contains a valuable collection. Milan has two great libraries, the Ambrosian and the National Library. It is now the chief commercial centre of northern Italy, the

mile contains 1,617 English yards, and the English statute mile (legalised 1593) 1,760 yards = 320 perches or poles. The mediæval English mile (divided into 10 furlongs) was equal to 2,203 $\frac{1}{3}$ yards, the old London mile to 1,666 $\frac{2}{3}$ yards, the ancient Scottish mile to 1,976 yards, the Irish mile to 2,240 yards, and the Welsh to nearly 4 miles English.

Mile, NAUTICAL, the length of a minute of the meridian. It varies, therefore, according to the latitude. It is, in other words, equal to a minute of arc on a circle whose radius is the radius of the curvature of the meridian at the latitude of the place. [DEGREE.] It is important to distinguish this from the geographical mile, which is the length of a minute of arc on the earth's equator, and is therefore a constant quantity—viz. 6,080 feet, and equals the Admiralty knot or mile (1.151 statute mile).

Miletus, an ancient Ionian city, on the Latmian Gulf, on the W. coast of Asia Minor, near the mouth of the Mæander. It was founded by a band of colonists from Pylos, became a thriving commercial town, and before 650 B.C. had planted some 60 or 80 colonies along the coasts of the Hellespont, the Propontis, and the Euxine. The Milesians long resisted the encroachments of the Lydian monarchs, but finally submitted to Cræsus. After his fall they were conquered by the Persians, but took the lead in a rebellion against Darius (500 B.C.), and, as a punishment, were transported to the mouth of the Tigris. Later, Miletus again became a busy mart, but never regained its lost glory. The philosophers Thales, Anaximander, and Anaximenes, and the historian Hecataeus were natives.

Milfoil, *i.e.* thousand leaves, is the English name of *Achillea millefolium*, also known as YARROW, a common British member of the order Compositæ, so called from its much-cut leaves. It is a herbaceous perennial, with erect stem, about a foot high, bearing a flat group (corymb) of small white or pink flower-heads, each containing very few florets. The whole plant has a pungent smell, and is astringent. The name *water-milfoil* is applied for the same reason to *Myriophyllum*, a genus of aquatic plants, three species of which are British, belonging to the mare's-tail family, Haloragacæ.

Milford, a parliamentary borough and seaport of Pembrokeshire, on the N. side of Milford Haven, nine miles S.W. of Haverfordwest and 282 miles W. of London by rail. The Haven is a magnificent sheet of water, 12 miles long and from one to two broad, with an average depth of about 17 fathoms; it is easily entered, and the numerous bays and creeks afford abundant shelter. The royal dockyard, constructed in 1790, was in 1814 removed to Pater, farther up the river.

Military Bands. [ORCHESTRA.]

Military Engineering. [MINING.]

Militia, an organised force of armed citizens enrolled and trained for the defence of their country. Such are the National Guards in France, the Landwehr in Germany and Austria, and the military force of the United States. In England

the Militia is recruited by volunteers, and organised in each county under the Lord-Lieutenant. They cannot be compelled to leave the kingdom at all, or to leave their county except in case of invasion or rebellion. They are called out for training for a few days every year.

Milk, the fluid secreted by the mammary glands of all female mammals for the support of their young. It consists of a solution of sugar, albuminoids, and salts, together with a certain amount of fat. The milk of all mammals is the same in the nature of its constituents, but the proportion in which they are present varies very much. Milk contains about 80 or 90 per cent. of water, and in that of the cow there is about 5 per cent. cream. When churned the globules (of which milk is largely composed) unite, and *butter* is formed, the residue being the buttermilk. If rennet (q.v.) be added to skimmed milk, *curds* and *whey* will be formed. *Cheese* is made by allowing the whey to separate and adding salt to the curds. Milk ferments spontaneously, the milk-sugar [LACTOSE] being converted into lactic acid (q.v.), alcohol, and carbonic acid gas.

Milk Fever. The establishment of the secretion of milk shortly after childbirth is usually attended with some small degree of constitutional disturbance, and if this be so marked as to appreciably affect the temperature of the mother the condition is known as milk fever.

Milk Sugar. [LACTOSE.]

Milkwort, the English name of the five native species of the considerable genus *Polygala*, the type of the order Polygalacæ, applying apparently to their supposed value as food for milch cows. Though some of the exotic species, such as the yellow-flowered *P. Chamæbuxus* of central Europe, and some red-flowered ones at the Cape, are shrubby, the British species are small herbs, mostly common on dry soils, with small entire leaves and racemes of flowers (either red, white or blue) of remarkable monosymmetric form, something like a pea-blossom. They have five persistent sepals, the two lateral ones, or "wings," petaloid but veined; from three to five petals, one forming a "keel" with a fringed extremity; eight stamens with anthers opening by pores; and a two-chambered, two-seeded capsule. The milk-worts are also called *gang-weeds* or *Rogation-flowers* from having been carried in Rogation-tide processions. *Glaux maritima*, a small member of the primrose family, with grey or glaucous leaves, is called *sea milkwort*.

Mill, JAMES (1772–1836), philosopher, was born in Forfarshire, and studied at Edinburgh University. He was licensed as a preacher in 1798, but in 1802 he came to London with Sir John Stuart of Fettercairn. He started the *Literary Journal* in 1803, and in 1805 became editor of the *St. James's Chronicle*. From 1808 to 1813 he was connected with the *Edinburgh Review*. His great work, the *History of India*, which occupied him from 1806 to 1817, obtained for him in 1819 an appointment in the India House as assistant examiner of correspondence. His friendship with Bentham, which

began in 1808, exercised an important influence on the development of his political and social views. The doctrines of the "Philosophical Radicalism" of which he was the chief exponent, were well-expressed in his essay on *Government* (1820), one amongst several contributed to the 5th edition of the *Encyclopædia Britannica*. In 1824 Bentham started the *Westminster Review*, for which Mill wrote several able essays. His *Analysis of the Human Mind* (1829) was an important contribution to empirical psychology. Among his other works were *Elements of Political Economy* (1821) and *A Fragment on Mackintosh* (1835). He was head of the India Office from 1830 to his death. His view of life was mechanical, and he could conceive of no other means of promoting social welfare; art, poetry, religion—the whole sphere of the æsthetic and moral emotions—lay entirely beyond his ken. His rigid and abstract method of reasoning—entirely *à priori* and deductive in scope—exercised a powerful influence in his own day.

Mill, JOHN STUART (1806–73), philosopher, son of James Mill (q.v.), was born in London. Up to his 15th year he was educated entirely by his father, who aimed at training him to be the exponent of his own political and philosophical views. Between the ages of three and eight he was taken through some of the principal Greek authors, and four years later he was launched on a course of logic and political economy. After spending part of the years 1820–21 in France with the family of Sir Samuel Bentham, he studied law with John Austin; but the project of a career at the bar was abandoned on his obtaining a clerkship in the India House (1823). The reading of Dumont's *Traité de Legislation*, a summary of Jeremy Bentham's views, formed, as Mill himself says, an "epoch in his life" and led to the establishment of a "Utilitarian Society" which met at the house of the sage himself; but at the meetings of the Speculative Debating Society (founded in 1825) he was brought into contact with philosophical Liberals of a different school—Maurice, Sterling, and other ardent youths whose ideas had been moulded by the teaching of Coleridge—and to their influence was mainly due the great mental crisis through which he now passed. The partial change which now took place in his views is observable in *Thoughts on Poetry* (1833), inspired by a study of Wordsworth and Shelley, and the articles on *Bentham* (1838) and *Coleridge* (1840) in the *London and Westminster*. But, although he was thus led to modify the doctrines in which he had been brought up, he never abandoned them. About 1837 he became acquainted with the system of Comte, and Comte's sociological method has greatly influenced the sixth book of the *Logic* (1843). The *Principles of Political Economy* (1848), which had been preceded by *Essays on Unsettled Questions in Political Economy*, written in 1831, was hailed as the last word on economic science, but the growth of the historical school has completely reversed the verdict. To the ensuing period belong *Liberty* (1859) and *Representative Government* (1861); the former, an eloquent plea on behalf of individualism, was written,

as were many of his works, in co-operation with his wife (previously Mrs. Taylor), who had died in the preceding year. *Utilitarianism* was published in 1863, and the *Examination of Sir William Hamilton's Philosophy* in 1865. During Mill's brief career in Parliament as member for Westminster (1865–68) his earnestness and sincerity were generally recognised. He incurred much hostility, however, by his support of Mr. Bradlaugh's candidature at Northampton, and by his activity against Governor Eyre owing to his ruthless suppression of the Jamaica insurrection. The last five years of his life were passed in retirement at Avignon with his step-daughter, Miss Helen Taylor. *The Subjection of Women* was published in 1869, and after his death appeared the *Autobiography* (1873), and *Three Essays on Religion* (1874), which indicated a certain reaction against his earlier Agnosticism.

Millais, SIR JOHN EVERETT, R.A. (b. 1829), was born at Southampton and brought up in Jersey, to which his family belonged. He became a student at the Royal Academy at the age of eleven, and in 1846 exhibited his first picture *Pizarro seizing the Inca of Peru*. He now became convinced of the conventionality and unreality of contemporary art—a belief in which he was confirmed by a study of Giotto, Ghiberti, and other early Italian painters and sculptors—and he joined with Rossetti, Holman Hunt, and others in founding the "Pre-Raphaelite Brotherhood," whose aim it was to give a faithful representation of nature. To this period belong *Isabella* (1849), *The Carpenter's Shop* (1850), *The Huguenot* and *Ophelia* (1852), *Autumn Leaves* (1856), and *The Vale of Rest* (1860). *The North-West Passage* (1874) is one of the finest examples of his later methods. His landscapes, such as *Chill October* (1871) and *The Fringe of the Moor* (1874), for the most part depict the wilder aspects of the scenery of Scotland. Among his best portraits are those of Mr. Bright (1880), Cardinal Newman (1882), and Lord Salisbury (1883). He was made an A.R.A. in 1853, and R.A. in 1863, and a baronet in 1885.

Millbank Penitentiary, a prison formerly situated on the Thames below Vauxhall Bridge, in the parish of St. Margaret and St. John, Westminster. It was completed in 1821, held over 1,000 prisoners, and was taken down in 1890. The idea of a "Panopticon" or circular prison, with cells on each floor and in the centre a room for the inspector from which he might see into every part of the building, originated with Jeremy Bentham, whose brother, Sir Samuel Bentham, had devised a structure of this kind for the supervision of industry. An Act of Parliament for the purpose was passed in 1794, and land at Millbank was conveyed to Bentham as trustee; eventually the contract with him was cancelled. The erection of the Pan-opticon, though it did not realise Bentham's hopes, marked an advance in prison management and discipline.

Millennium, a period or interval of a thousand years. In theology, the period in which the kingdom of Christ is to be all-powerful on earth, universally expected by Christians during the early centuries of our era. This expectation is called Chiliasm.

Millepedes, the animals belonging to the order Chilognatha or Diplopoda, which together with the order of Centipedes form the class Myriapoda (q.v.).

Millepora, a genus of that group of corals known as Hydrocorallina (q.v.).

Miller, HUGH (1802-56), geologist and man of letters, was the son of a seaman of Cromarty, where he was born and brought up. Hoping to gain time for writing, he became a stonemason, and continued to labour in the quarry for fifteen years. His first volume, *Poems written in the Leisure Hours of a Journeyman Mason* (1829), was favourably reviewed, but he himself soon became convinced that he lacked the poet's inspiration, and determined that henceforward he would attempt prose alone. *Scenes and Legends of Cromarty* appeared in 1835. About the same time he gave up stonecutting and became a bank clerk. His pamphlet entitled *A Letter to Lord Brougham* (1839) brought him to the notice of the leaders of the "Free Church" party, and in 1840 he became the editor of their journal, the *Witness*. The appointment occasioned his removal to Edinburgh, where he remained during the rest of his life. The mental strain proved too great for a constitution already weakened by the hardships of his youth, and in a fit of madness Miller committed suicide. In the *Witness* were published the series of papers called *The Old Red Sandstone* (1841). In his pictorial works, *Footprints of the Creator* (1850) and the *Testimony of the Rocks* (1857), he wrote eloquently on behalf of revealed religion. He was also author of an extremely interesting autobiographical sketch called *My Schools and Schoolmasters* (1854).

Millet (from the Latin *mille*, "a thousand," from their numerous small fruits) is a name applied to a variety of cereal grains, much grown in hot countries for human food, but not entering largely into English commerce. The name is chiefly applied to *Panicum miliaceum* and other species of that genus, whilst Great Millet, Indian Millet, and Turkish Millet are names for *Sorghum vulgare*, the Durra (q.v.). *P. miliaceum*, the common millet, has been cultivated from prehistoric times in Asia, Egypt, and southern Europe, its grain occurring in the Swiss lake-dwellings. It requires a rich, friable soil, and yields a very nutritious grain, which makes excellent bread. *P. italicum*, Italian Millet, seems to be indigenous in Japan, China, and the Indian archipelago, and its cultivation spread at an early period through Russia and Austria to Switzerland, where its grain is found in the oldest lake-dwellings. A single spike of millet often yields two ounces of grain, the total yield being five times as much as wheat. In England millet is mainly used for poultry.

Millet, JEAN FRANÇOIS (1814-75), French peasant painter, was born in the hamlet of Gruchy, near Gréville, in Normandy. In his boyhood he worked with his father in the fields, but the aid of the municipality of Cherbourg enabled him to study painting under Monchel in that town and afterwards under Delaroche in Paris. After eight years of poverty in Paris, he settled at Barbizon, near

Fontainebleau, where he formed a close friendship with Théodore Rousseau. At Barbizon all his best works were produced, including *The Angelus* (1859), *The Sower* (1850), *Peasants Grafting* (1855), and *The Shepherdess and Flock* (1864). In these works the life of the fields is depicted with the utmost fidelity to nature.

Millstone Grit. [CARBONIFEROUS SYSTEM.]

Milman, HENRY HART (1791-1868), Dean of St. Paul's and ecclesiastical historian, was educated at Eton and Brasenose College, Oxford, and in 1817 was presented to the living of St. Mary, Reading. The publication of his drama *The Fall of Jerusalem* (1820) was followed by his appointment to the chair of poetry at Oxford. He was Bampton Lecturer in 1827, became rector of St. Margaret's, Westminster, in 1835, and in 1849 was made Dean of St. Paul's. In 1829 appeared the *History of the Jews*. His *History of Christianity under the Empire* (1840) and *History of Latin Christianity* (1855) are not likely to be soon superseded. Among Milman's other works were the *Martyr of Antioch* (1822), a tragedy, some unfinished *Annals of St. Paul's Cathedral*, various essays and hymns.

Milne, SIR DAVID, naval officer, born at Musselburgh in 1763, entered the navy in 1779. As lieutenant he distinguished himself in numerous expeditions, and in 1795 he was posted. In 1800, after one of the most magnificent actions of the war, he captured the *Vengeance*. He became rear-admiral in 1814, and in 1816 he assumed the chief command in North America, but before leaving for his station he was allowed to go as second in command with Lord Exmouth's expedition to Algiers; for his share in the bombardment he was made a K.C.B. He was made vice-admiral in 1825, G.C.B. in 1840, and admiral in 1841, and up to within a few days of his death in 1845 he was commander-in-chief at Devonport.

Milne-Edwards, HENRI (1800-85), zoologist, was born at Bruges of English parents. After graduating in medicine at Paris he for some time practised as a physician, but subsequently devoted himself exclusively to zoology. He was appointed professor of entomology at the Jardin des Plantes in 1841, and professor of physiology and zoology in 1844. His researches in the lower forms of animal life contributed greatly to the progress of zoology. His chief work was *Leçons sur la Physiologie et l'Anatomie Comparée* (1857-81).

Milner, ISAAC (1751-1820), and JOSEPH (1744-97), two brothers, clergymen of the Evangelical school, and joint authors of *A History of the Church of Christ*, which no longer enjoys its former repute. Joseph was for many years head-master of Hull grammar school, and in 1797 became vicar of Holy Trinity Church. Isaac was appointed Dean of Carlisle in 1791.

Milo, a famous athlete, born at Crotona, in Magna Græcia, lived towards the close of the 6th century B.C. He was several times crowned for victories in wrestling at the Olympic and Pythian games, and performed many marvellous feats. In 511 B.C. he led an expedition against the Sybarites.

Whilst he was endeavouring to rend asunder a tree, his hand became caught in the fissure, and he was torn to pieces by wolves.

Miltiades, an Athenian general, hereditary tyrant of the Thracian Chersonese, accompanied Darius Hystaspes against the Scythians, but afterwards incurred his enmity and fled to Athens. Here he was elected one of the ten generals, and during his term of command inflicted a crushing defeat at Marathon (q.v.) on the Persian host led by Datis and Artaphernes. In consequence of an unauthorised attack on the island of Paros he was thrown into prison, where he died of a wound received in the expedition.

Milton, JOHN, was born in Bread Street, Cheapside, on the 9th December, 1608. His father, a scrivener, was a man of enough education to enter into his son's ambition, and it was by his support that the latter was able to adopt a life of study. From the first the lad applied himself industriously to work. While at St. Paul's school he produced his first attempts in poetry, paraphrases of Psalms cxiv. and cxxxvi. From 1625 until 1632 he was at Christ's College, Cambridge, gaining a knowledge of Hebrew, French, and Italian in addition to the ordinary classics. To this period belong many of his Latin poems, and several of his English—notably *On the Death of a Fair Infant*, *On the Morning of Christ's Nativity*, *The Passion*, and *On Shakespeare*. On leaving the university he lived for nearly six years at Horton, in Buckinghamshire, whither his father had retired. There he wrote *L'Allegro* and *Il Penseroso*, *Arcades*, *At a Solemn Music*, *On Time*, and the pastoral masque known since his death as *Comus*. The two poems *To the Nightingale* and *Upon the Circumcision* belong also to the Cambridge or the Horton period. In these early poems Milton, although giving proof of deep religious conviction, still showed himself capable of appreciating the lighter sides of life. His greater work, for which he began consciously to prepare himself, was not to be carried out until years of political and sectarian strife had left their mark upon his character. In 1637 he wrote *Lycidas*, as his contribution to a volume published at Cambridge in honour of Edward King, who had been drowned in crossing to Ireland. Early in the next year he went to Italy as far as Naples, where he visited Manso, the friend of Tasso. He had intended to see Greece, but the news of the Puritan resistance to the king made him consider it was base for him to be cultivating his intellect abroad at such a time. Accordingly he turned back, but lingered at Rome, Florence, and Venice. The most interesting incident of his tour was his intercourse at Florence with Galileo, then old and blind, the prisoner of the Inquisition, an acquaintance which made a deep impression on his mind. Meanwhile, his closest friend, Charles Diodati, had died, in whose memory he wrote a fine Latin poem, *Epitaphium Damonis*. In it he mentions, as he had already mentioned in a poem to Manso, that he was meditating an epic on King Arthur, which, however, came to nothing. For the next two or three years

he was casting about for a subject on which to make a great effort. There exists a list in his writing of nearly a hundred subjects, among which *Paradise Lost* is sketched as a tragedy. During this time he lived in Aldersgate teaching his nephews and a few other boys on the system propounded in 1644 in his tractate *Of Education*. In 1643 his marriage with Mary Powell, the daughter of a strong Royalist, led to a curious episode. His wife, soon after the marriage, went back to her old home, and declined to return to her husband, who at this time published an anonymous pamphlet on divorce, alleging that incompatibility of temper is a ground for separation. In the spring of 1644 he brought out a second edition, adding his name and a dedication to Parliament and the General Assembly. He was charged with having published this without official license, whereupon he printed, unlicensed and unregistered, *Arcopagitica*, an argument addressed to Parliament in favour of freedom of the press. In 1645 he was reconciled to his wife, and in 1646 he brought out a volume of his early poems. After the execution of the king he was made Latin secretary to the Council of State, with the duty of writing letters to foreign courts, and of holding interviews with foreign agents. This post he kept through Cromwell's rule. Meanwhile he was busy in the warfare of pamphlets, deserting poetry for what he considered a call of duty. Amongst his publications were *Eikonoklastes*, in answer to the Royalist *Eikon Basilike*, and a reply to a defence of the king by Salmasius, in which he displayed a ferocity of language only less than that with which he afterwards assailed Morus, to whom he erroneously ascribed the authorship of a similar production. A worthier example of his resentment was the sonnet of 1655 on the massacre of the Vaudois Protestants. His private life during this time was not happy. Working for the state with the knowledge that he was ruining his eyesight, he became blind in 1652, in which year his wife and son died. He lived with his three daughters until 1656, when he married Katharine Woodcock, who died fifteen months later. On the death of Cromwell he sought to stem by his pamphlets the reaction in favour of monarchy, but on the Restoration he was left unharmed. In 1663 he married Elizabeth Minshull. In 1658 he had begun *Paradise Lost*, which was published in 1667, and followed four years later by *Paradise Regained* and *Samson Agonistes*. Between 1669 and 1673 he also published a *Latin Grammar*, a *History of Britain before the Conquest*, and a book on logic. He died on the 8th November, 1674, and was buried in St. Giles' Church, Cripplegate. His literary life falls into three strongly-marked divisions—first, an early poetic period, ending with his tour abroad; secondly, twenty years, except for the composition of a few sonnets, almost exclusively devoted to prose; and finally, the years in which his epics were composed. In majesty of diction, alike in prose and verse, as well as in strenuousness of moral effort, he is without a rival among English writers.

Milwaukee, the largest city of Wisconsin,

United States, stands on the western shore of Lake Michigan, at the mouth of the river Milwaukee, 85 miles N. of Chicago. Its progress has been largely due to the water power of the river, which is joined about half a mile above its mouth by the Menomonee. The harbour has been much improved, and is now one of the finest on the chain of lakes, with docks extending 20 miles. Several railways converge at Milwaukee, and it is an important centre of the lake navigation. Engines, machines, and iron and brass wares are manufactured, but the chief industry is the trade in corn and provisions. The population is very largely of German origin.

Mimes, mimic actors, performers in the old Greek, Italian, and Sicilian low comedies called mimes. Some specimens of mimes by one Herondas have lately been discovered. In Sicily and Italy action and movement were special features of these dramas, so that in some [PANTO-MIMES] speech was altogether dispensed with.

Mimicry, a term introduced by Bates in 1862 to denote that close external likeness which causes animals quite distinct to be mistaken for each other. The fact of such resemblances among British and European insects had long been known, and had found expression in specific and popular names, *e.g.* *crabroniformis* (resembling a hornet), Hornet-moths, Wasp-flies, etc., but no theory as to the reason of such resemblances was advanced. While exploring the Amazon Bates noticed that the butterflies of the families Heliconidæ and Danaidæ were closely mimicked by some of those of the family Pieridæ, and that this resemblance was general, not special—*i.e.* that the Pieridæ resembled other (not new) species of the other families inhabiting the same locality. He observed (and in this he was confirmed by Wallace) that the mimicked families were not attacked by birds, lizards, or insects; and in his famous paper on the subject he laid down the two propositions: (1) That the form mimicked has some special protection (as a nauseous taste or smell), or some means of defence (as a sting), and (2) that it is more abundant than the mimickers, which are eatable and defenceless. When more material had been accumulated, Wallace formulated laws adopting Bates's propositions, and adding the following: (1) That the areas inhabited by mimickers and mimicked are the same, (2) that the mimickers differ from the bulk of their allies, and somewhat simplified Bates's definition as to the resemblance being only external. These laws were based on observations made on insects, and to them only do they in strictness apply. But mimicry exists among much higher animals, and the general principle is the same—that of protection of some kind. The colouring of the venomous *Elaps* of Mexico is mimicked by the innocuous *Pliocercus*, with the same habitat. Our own cuckoo mimicks the plumage of the hawk, and one genus is called Hawk-Cuckoo; and the resemblance of the Aardwolf (*Proteles lalandii*) to the Striped Hyena is probably a case of protective mimicry. It must be remembered that the term "mimicry" implies no conscious imitation, and Wallace believes

that the resemblances arose by means of natural selection. But since Bates and Wallace wrote, other investigators have carried the matter farther, as will be seen from the following scheme of animal coloration condensed from the paper of Mr. Poulton, F.R.S., read before the British Association at Leeds in 1890:—

I. CRYPTIC COLOURS (for concealment).

1. PROCRYPTIC (protective). The green pipe-fish is well concealed among zostera leaves, but conspicuous in clear water.
2. ANTICRYPTIC (aggressive). The South American horned frog buries itself in the earth, with the colour of which it harmonises, and seizes small animals as they approach.
3. ALLOCRYPTIC (protective and aggressive). Small crabs deck themselves with seaweed.

II. SEMATIC COLOURS (warning and signalling).

1. APOSEMATIC. The brilliant coloration of nauseous insects and the black-and-white coloration of skunks (which emit an intolerable stench).
2. EPISEMATIC (serving for recognition). The white scut of the rabbit and the white marks on the hind-quarters of deer and antelopes.
3. ALLOSEMATIC (in which the warning colour or noxious quality belongs to another animal). Hermit crabs protect themselves by having sea anemones as commensals.

He then defines mimicry as "false warning or signalling colours, repelling enemies by the deceptive suggestion of some unpleasant or dangerous quality, or attracting prey by the deceptive appearance of something attractive to them." Even foreign objects commonly associated with some well-defended and aggressive species may be mimicked by a comparatively defenceless form.

1. PSEUDAPOSEMATIC (protective). The mimicry of Bates and Wallace as described above.
2. PSEUDEPISEMATIC (aggressive and alluring). The flies of the genus *Volucella* so closely resemble humble-bees that they lay their eggs in the nests of the latter insects without detection, and their larvæ feed on those of the bees. The angler-fish, which attracts other fish by its mouth filaments, is an example of alluring mimicry.
3. PSEUDALLOSEMATIC (the use of foreign objects for concealment). Mr. W. L. Selater (*Proceedings of the Zoological Society*, 1891, p. 462) records the fact that an immature homopterous insect in South America mimics the leaf-carrying ant and the leaf it carries.

Mimosa, a large genus of Leguminosæ, the type of the sub-order Mimoseæ, including some 200 species, almost all tropical and mostly American. They are herbs, under-shrubs, shrubs, or climbers, with bi-pinnate leaves, which have generally numerous small leaflets, and are sensitive. Many species are prickly. They have small, poly-symmetric flowers, with five sepals, five petals, and not more than ten stamens. *M. pudica* and *M. albida* are the most commonly-cultivated sensitive plants. [SENSITIVE PLANTS, SLEEP IN PLANTS.]

Mimosa Bark and Extract. [WATTLE.]

Mina, Minah. [MYNA.]

Minaret, a slender turret or tower, with balconies projecting at intervals, rising above a Mohammedan mosque. From these balconies the people are summoned to pray five times a day by persons called *muezzins* (q.v.).

Minas Geraes, a province of south Brazil, lying to the N. of Rio de Janeiro, and separated from the coast by Espirito Santo. Its surface is composed

mainly of high table-land, much of which belongs to the Serra do Espinhaço and its spurs; the highest point of the range is the Pico de Itatiaia, over 6,000 ft. Herds of cattle graze on the wide prairies, and in the E. there are extensive coffee plantations. There are diamond, gold, iron, and other mines. The capital, Ouro Preto, was founded in 1699.

Minden, a Prussian town in Westphalia, on the Weser, 35 miles W. of Hanover. The recently-restored Roman Catholic church, ranging in date from the 11th to the 14th century, was formerly a cathedral. The new bridge (1874) is 600 ft. long and 24 ft. broad. Minden has tobacco and other manufactures, and a large trade by the river. Here an army under Ferdinand of Brunswick and Lord George Sackville defeated the French in 1759.

Mine (NAVAL), a case, usually of iron or steel, which being charged with explosive material can be sunk or submerged in a ship channel in such manner as to endanger any hostile vessel that may attempt to pass over it. A mine may be arranged to be discharged by electricity transmitted by means of a cable from an observation station on shore or ship-board, or by the striking against it of any heavy body. Mines which are not moored, but which are allowed to drift, are towed, are automobile, or are by any method taken or sent through the water expressly to do this work, are known as torpedoes. The explosive commonly used in British service mines of all classes is gun-cotton. [MINING.]

Mineralogy is the science of minerals. A *mineral* may be defined as a natural, homogeneous, inorganic substance, this definition excluding the artificial compounds of the laboratory, heterogeneous substances (such as are many rocks), and organic substances (such as pearl, amber, or coal). Most minerals, though containing inconstant impurities, have a definite chemical composition, expressible in a formula; and, though often occurring in indefinite ungeometrical shapes, have also a definite crystalline form. Chemical analysis and crystallography (q.v.) thus afford the chief means of identifying minerals; but, in addition to form and composition, minerals have other distinctive characters, optical, thermal, electrical, magnetic, aggregational, etc. Among the *irregular* or *indeterminate* forms of minerals are the *nodular*, with irregularly-rounded surfaces, as in flint (q.v.); the *mammillary* or *botryoidal*, with spheroidal prominences, as in malachite (q.v.) and kidney iron-ore; the *stalactitic*, or icicle-like cylindric masses, as in calcite (q.v.); and the *dendritic*, tree-like, or mossy, as in pyrolusite. Cleavage is an important character closely related to crystalline form. [CRYSTAL.] The chief optical characters of minerals are transparency, refraction, polarisation, lustre, colour, streak, and phosphorescence (q.v.). Transparency, or diaphaneity, the power of transmitting light, is of five degrees—*transparent*, transmitting distinct outlines; *sub-transparent*, when they are indistinct; *translucent*, transmitting light only; *sub-translucent*, or translucent when very thin; and *opaque*. Refraction (q.v.) is also closely related to crystalline form, and polarisation (q.v.) and lustre (q.v.) depend

mainly upon refraction. Colour sometimes presents so wide a range within the limits of one mineral species as to be of little discriminative value; but streak, the colour of the mineral when abraded, is more useful. Among other optical characters often very distinctive are dichroism (q.v.) and fluorescence (q.v.). Thermal, electric, and magnetic conductivity are not much employed by the mineralogist in diagnosis; but are connected with the crystalline system. The pyro-electric polarity of crystals of tourmaline, topaz, boracite, and other hemihedral forms, which causes them to reverse their electric character as they are heated, is important; and some minerals, such as lodestone (q.v.), are notably magnetic. Fusibility is measured by a scale of comparison drawn up by Von Kobell, in which antimonite, fusible in a candle-flame, is 1; natrolite, slightly so, 2; almandine-garnet, requiring a blow-pipe, 3; actinolite, only fusible in thin splinters, 4; orthoclase, fusible with difficulty, 5; and bronzite, very infusible, is 6. The aggregational characters of minerals include (1) their molecular rigidity, whether gaseous, liquid, or solid; (2) their tenacity, including sectility or capability of being cut with a knife, malleability or capability of being beaten into foil, ductility or capability of being drawn into wire, flexibility, the property of bending, elasticity, that of springing back again when bent, and brittleness; (3) their fracture; and (4) their hardness (q.v.). The surfaces of fracture, whether conchoidal, or shell-like, as in flint, splintery, as in chert, or hackly, as in cast-iron, are sometimes characteristic. Other characters of minerals are their specific gravity (q.v.), which is generally compared to that of water at 60° Fahr., or 4° C., touch, taste, and odour. The soapy or greasy touch of many magnesian minerals, especially hydrous silicates, is characteristic. [SOAPSTONE.] Taste is necessarily confined to soluble, odour to volatile minerals. The chief tastes are named as saline, in common salt; alkaline, in soda; cooling, in nitre; astringent, in the vitriols; sweetish astringent, in alum; and bitter, in Epsom salts (q.v.). Among the chief odours are the foetid smell of sulphuretted hydrogen given off by some limestone [STINKSTEIN], and the argillaceous, or earthy smell of clays and serpentine when moistened.

Of these characters, chemical composition is mainly employed in the classification of minerals. The several thousand species of minerals which have been described, the vast majority of which are rare substances of no commercial or even geological importance, are grouped into five main divisions. These are (1) native elements, subdivided into the metals and the non-metals, (2) sulphides, arsenides, etc., (3) chlorides and fluorides, (4) oxides, and (5) (by far the largest division) oxygen salts. This last is subdivided into some seven classes:—(1) carbonates, (2) silicates, (3) tungstates, etc., (4) sulphates and chromates, (5) borates, (6) nitrates, and (7) phosphates, arseniates, etc.

Mineral Veins, or **LODES**, seem to have been originally fissures, the sides or *cheeks* of which have been coated with successive layers of minerals. These do not always completely fill the fissure; but

in other cases the vein has been reopened alongside of a former infilling. Veins vary in width from less than an inch up to 150 feet or more. They occur especially among igneous and metamorphic rocks, and there is a curious relation between the nature of the *country rock*, as the rock traversed is termed, and the contents of the vein. Thus in Cornwall one set of parallel and contemporaneous lodes running east and west contain tin-ore where they traverse granite, and copper-ore where they are in slate ("killas"); and another set, running north and south, and of a later date, yield lead and iron-ores. The minerals most commonly found in veins are the non-metalliferous *vein-stones*, quartz, calcite, baryte, and fluor, and the *ores*, such as galena, blende, cassiterite, pyrites, native copper, and gold. Though they have occasionally communicated with the surface so as to allow of pebbles and land-shells being washed down into them, veins seem generally to have been filled from below by deposits from heated solutions.

Mineral Waters, *i.e.* waters containing dissolved in them a greater or less amount of gaseous or mineral matter, have been known and prized since early times. Evidences of their use by the Romans are seen at Bath, Aachen, and many other localities, whilst references to them occur in the writings of Pliny, Hippocrates, and Homer. The source of these waters is usually the rain, which dissolves out some of the constituents of the soils through which it percolates, so that the characteristics of the water are dependent upon the geological strata of the district. Many of the mineral waters possess undoubted medicinal value, which, however, is frequently overlooked owing to the assumption of almost universal healing power. The course of treatment adopted at most spas and wells is that of baths and drinking. The water is usually drunk in the morning before breakfast, and the baths taken during the forenoon, moderate exercise and strict dietary regulations being usually also insisted on. Treatment should always be only taken under medical advice, as indiscriminate drinking, etc., can only lead to injurious effects. The mineral waters may be divided into the following classes:—

(1) *Thermal*, where the springs have a high temperature, but contain few dissolved minerals, *e.g.* the thermal waters of Bath, Buxton, etc.

(2) *Saline*, characterised by the presence of common salt, as the waters at Droitwich, Nantwich, Harrogate, Cheltenham, Leamington, Baden-Baden, Kissingen, and Homburg.

(3) *Alkaline*, in which the carbonate of the alkaline metals (sodium, potassium, or lithium) are present, and usually also carbonic acid gas. Examples of such waters are found at Mont Dore, Vichy, Apollinaris, Ems, and other places.

(4) *Sulphated saline*, in which the chief mineral substances are the sulphates of sodium or magnesium, accompanied usually by common salt and soda. In this country, Leamington, Scarborough, Cheltenham, are well known for such waters, while on the Continent Carlsbad, Hunyadi, Seidlitz, Friedrichshall, etc., have acquired notoriety.

(5) *Chalybeate*, containing dissolved salts of iron.

They have an inky taste and occur among other places at Harrogate, Tunbridge, Llandrindod, Godesberg, Spa.

(6) *Sulphur*, whose characteristic feature is the presence of free or partly combined sulphuretted hydrogen, which imparts to the water the odour of rotten eggs. Well known localities of such springs are Harrogate, Llandrindod, Builth, Aachen, Aix-les-Bains, Engheim, Baden, etc.

(7) *Calcareous*, or earthy, which contain the carbonate of calcium and magnesium, or sulphate of calcium, as the waters of Buxton, St. Arnaud, Taunus.

Aërated waters with or without the addition of minerals, or flavoured by fruit essences, are also known as mineral waters. The manufacture of such beverages has now become a most important industry. In these cases the flavouring material, *e.g.* essence of lemons, raspberry, pear, orange, etc., or the mineral material, is first added to the water, which is bottled and then strongly charged with carbonic acid gas, pumped in under strong pressure by suitable machinery.

Minerva, a Roman goddess, probably of Etruscan origin, who subsequently became identified with the Greek Athene (q.v.). Her name is probably derived from the same root as *mens*, and she was the goddess of "mind" in the widest sense—not merely the patroness of poetry and medicine, of all art, science, and handicraft, but the originator of every subtle thought and heroic impulse. She had temples on the Capitol, the Aventine, and the Coelian Hill. Her festival, the *Quinquatrus*, was celebrated March 19–23, and the lesser *Quinquatrus* June 13–15.

Minghetti, MARCO (1818–86), Italian statesman, was born of a rich merchant family at Bologna. In his youth he travelled in France, Germany, and Great Britain, paying special attention to agricultural economics. After holding office in the short-lived Liberal Ministry of Pius IX. (1848), he entered the service of Charles Albert of Sardinia, and became the intimate friend and supporter of Cavour (q.v.), whose work he carried on after the death of the latter in 1861. He was Minister of the Interior under Cavour in 1860, President of the Council and Minister of Finance 1863–68, came to London as ambassador in 1868 and was again Prime Minister in 1873–76. He published *Della Economia Pubblica* (1859), and other works.

Miniature, in *minium*, or vermilion, used chiefly in illuminating books; hence an illumination or other painting on a small scale, especially a portrait, hence anything small or on a small scale.

Minim, in music, a note equal in time-value to one-half of a semibreve. In early mediæval music it was the shortest note used. In chemistry the minim is one-sixtieth part of a fluid drachm, and is regarded as about equal to one average drop.

Mining. The art of mining consists of those processes whose object is to find useful minerals, and extract them from below the surface of the earth. Mines are generally classified by legal

enactment according to the deposits contained in them; but this classification varies in different countries. The question of ownership, too, receives different solutions in different parts of the world. In Great Britain the possessor of freehold land usually owns all the mines beneath; but special cases often occur in which mines in the land at different depths belong to different people. Mineral deposits may be divided into two kinds:—(1) tabular deposits, including *beds* of stratified material and *veins* of mineral ores. Beds are usually of aqueous origin, while veins may occur in either igneous or aqueous rocks, and are often formed by the filling up of a crack or fissure in the rock by a different mineral. (2) Masses, generally of irregular shape and of igneous origin; they are never stratified. Both kinds of deposit may have suffered partial displacements, or *faults*, the result being the same as if the bed or mass of rock had been split and then one-half of the deposit moved away from the other along the split. In prospecting for minerals, attention is paid to the geology of the district, a great deal of information being obtained from the faces of cliffs, beds of rivers, railway cuttings, etc. Fragments of minerals are looked for on the ground, and special search is made for any outcrop of the bed or vein itself. If the bed crops out, then exploratory workings are often made at the surface; otherwise boring is resorted to. A small hole is made in the deposit by means of a cutting tool fixed to the end of a rod. As the hole gets deeper, other rods of equal length are attached to the first and are raised into a tower, whose height is equal to the length of one rod, from which they are again sent down into the hole. The *débris* caused at the bottom is cleared away by other tools. To avoid loss of time in connecting and disconnecting the rods when the hole gets deep, a rope is often employed, and more recently a diamond drill has been used to make an annular cutting—the column of rock, etc., left in the centre being removed from time to time. If the boring shows that the deposit is worth working, excavations are made, the process of “breaking ground,” as it is called, being varied according to the nature of the ground. Soft earth is removed by the shovel or pick, but hard rocks are removed by boring or blasting. Gunpowder, nitro-glycerine, and special gun-cotton are used for blasting, the charge being fired by a safety fuse or by electricity. Machine drills for boring the hole before blasting have been immensely improved of late years, and differ greatly in design. Horizontal passages, or “levels,” are made by alternately boring holes and then blasting, and the same is done in the making of more or less vertical pits or shafts. The passages and pits are secured against collapse by timber or iron props, or by some sort of masonry. The vein of mineral is reached by a suitable arrangement of levels and shafts depending on the inclination of the vein, and the mineral itself is worked away in a series of steps. As the miner cuts away a few steps, the ore is drawn into the level from which he is working, and the rubbish is put on one side; or he may cut steps down from one level to another, and the ore

rolls into the lowest one, at the bottom of a shaft or “winze” specially cut there, and up which it is afterwards drawn. Sometimes the roof of a level is excavated, the men erecting platforms upon the rubbish from one part, to enable them to work higher. In coal-mines where large beds of mineral are to be worked, pillars of coal are often left to support the roof of the mine, and this is known as the “port and stall” or pillar system; or the coal is wholly removed from the faces of roads, generally parallel to each other, the roof being supported by props. This is known as the long well system. Other excavations have to be made in very watery ground; a water-tight lining or “tubbing” is often added to the shaft, or in some cases the water can be drained away by a level or “adit.” The ventilation of mines is of great importance, owing to the noxious gases which often escape from the deposits; and, owing to the inflammability of many such gases, care is used in the system of lighting employed. Where no inflammable gases are evolved, torches, candles, and electricity are used; but in coal-mines special safety-lamps are employed. The mineral excavated is generally conveyed along the level in wheelbarrows or trollies to the bottom of a shaft, where it is raised by machinery, either in buckets or large cages, the latter often serving to convey the miners as well. *Military Mining*, i.e. the excavation of underground passages in which explosives are lodged so as to destroy the enemy’s works. Forms an important branch of modern warfare.

Minium, a term originally applied to both cinnabar and red-lead, the two pigments being incompletely distinguished; when, however, the distinction between them was understood, it became confined to red-lead. It is extensively used as a pigment, and in the production of porcelain and flint-glass. [LEAD.]

Mink, a popular name for a partially aquatic species of the genus *Putorius*, from the northern parts



MINK. (*Putorius lutreola*.)

of both hemispheres. They are closely allied to the weasels, which they resemble in form, though of much larger size. *P. lutreola* is the European, and

P. vison the American Mink. The rich brown fur of both is valuable, and for its good qualities as a ratter the American form is largely bred. *P. sibericus*, the vison from Siberia, seems to link these forms with polecats.

Minneapolis, the largest city of Minnesota, United States, is situated on both banks of the Mississippi, eight miles W. by N. of the capital, St. Paul. The original town stood on the right bank, but St. Antony, on the opposite side, was incorporated with it in 1873. The prosperity of Minneapolis is mainly due to the water-power furnished by the river, which falls about 80 feet as it passes through, with an abrupt descent of 16 feet at the falls of St. Antony. The university is open to both sexes. The Government Loan buildings are an immense pile, with a garden on the roof. Flour-milling and saw-milling are the principal industries.

Minnesingers, German minstrels and poets of the 12th and 13th centuries, called "singers of love," from the fact that love was a favourite subject with them. They were usually of noble descent and sang in the Suabian dialect.

Minnesota, one of the United States, bounded by Canada on the N., Dakota on the W., Lake Superior and Wisconsin on the E., and Iowa on the S.; area 83,365 square miles. The table-land in the N.E. rises to a height of 1,360 feet; the lowest elevation at the S.E. extremity is 660 feet above the sea-level. The south portion of the state consists entirely of prairie, but north-east of the Mississippi runs a broad belt of white pines, and in the north-east portion of the state there are extensive marshes, scantily covered with the tamarack and fir. Minnesota is the great watershed between the Gulf of Mexico and Hudson's Bay, and the Mississippi, Red River of the North, and St. Lawrence, all have their sources in its northern uplands. The Minnesota, one of the chief tributaries of the Mississippi, joins it between Minneapolis and St. Paul. Every part of the state is thickly studded with clear lakes, the largest being Red Lake, with an area of 530 square miles. Some of the best wheat in America is grown in Minnesota, and the oats and potatoes are also of good quality. The chief minerals are iron, and a peculiar kind of red clay or pipe-stone. St. Paul is the capital, and Minneapolis (q.v.) the largest town. Minnesota became a territory in 1849, and was admitted to the Union in 1858.

Minnow (*Leuciscus phoxinus*), a small fish of the Carp family, widely distributed in rivers and streams of Britain and the Continent. English specimens are rarely more than three inches long; but, according to Dr. Günther, in favourable localities this fish may reach a length of seven inches. The colour above is dusky olive, with dark spots, lighter on the sides, and white on the belly, which is rose-tinted in spawning time. Minnows prefer clear, shallow streams, and in winter hide under stones and overhanging banks. They feed on aquatic vegetation, insects and their larvæ, worms, and molluscs; and in times of scarcity the stronger prey upon the weaker, while large fish prey upon the minnows.

They are esteemed for food, and are taken with a hand-net; they furnish excellent bait.

Minorca, the most easterly of the Balearic Islands (q.v.) and the second in size. It is 22 miles N.E. of Majorca, and has an area of 284 square miles. The coast is rugged, and, except on the south side, much indented, the finest inlet being that which forms the harbour of Port Mahon. The surface rises gradually to the central point, Mount El Toro (4,793 feet). It belonged at one time to England.

Minos, a mythical King of Crete, the legends concerning whom were a relic of the Phœnician occupation. In Greek mythology he appears as the son of Zeus and Europa. He was said to have enacted a code of laws communicated to him by Zeus himself, and to have become after his death the judge of the nether world.

Minotaur, a fabulous monster, supposed to have had a human body and the head of a bull. He was confined in the Cretan labyrinth, and lived on human flesh. He was killed by Theseus, son of Ægeus, King of Athens, who volunteered to be one of the seven youths and seven maidens whom Minos, King of Crete, compelled the Athenians to send yearly to be devoured by this monster.

Minsk, a government of west Russia, S. of Vilna, with an area of 35,282 square miles, three-fourths of which are swamp, forest, and moor. MINSK, the capital, is situated on an affluent of the Beresina, 430 miles S.W. of St. Petersburg.

Mint (*Mentha*), a genus of Labiatae (q.v.), natives of sub-tropical and temperate regions, the number of species being indeterminate owing to variation and hybridism. They have square stems; opposite, aromatic leaves; small flowers in verticillasters (q.v.), often crowded into terminal spikes; and pale, sub-equal, corolla-lobes. Among British species are *M. viridis* (Spearmint), used for sauce; *M. Piperita* (Peppermint), cultivated for its volatile oil; and *M. Pulegium* (Pennyroyal), employed in female disorders. The stearoptene, or camphor, dissolved in the volatile oil of varieties of *M. arvensis*, is the *menthol*, or *Chinese oil of peppermint*, now largely used for neuralgia.

Mint, a place set apart for the coining of money. There used to be many mints in England; now all good money is coined in the Mint, Tower Hill, London, which is an extensive establishment, the privilege of coining being a royal prerogative.

Minto, GILBERT ELLIOT, 1ST EARL OF (1751-1814), Governor-General of India, was educated at Oxford, and called to the bar in 1774. He entered Parliament in 1776, and was Viceroy of Corsica 1794 to 1796, and envoy-extraordinary to Vienna in 1801. The chief events of his Indian Viceroyalty were the consolidation of the British power, the conquest of Bourbon and the Mauritius from the French (1810), the capture of Java (1811), and the opening of diplomatic relations with Persia, Afghanistan, and the Punjaub.

Minuet, a graceful and dignified figure-dance in slow triple time, invented about the middle of the 17th century, which retained its popularity in England for about a hundred years.

Miocene (Greek *meion*, "less"; *kainos*, "recent"), a system of Tertiary rocks, named from the fact that less than 50 per cent. of its Mollusca belong to species still living. The system is unrepresented in Britain (unless by some of the Mull and Antrim basalts), which was probably dry land during the Miocene period. Much of Europe seems to have been covered by large lakes and shallow arms of the sea, in which were deposited the sandy marls of the "Faluns" of Touraine and the sandstones, conglomerates, and lignites of the Swiss "molasse." The Eningen beds in the latter have yielded abundant fossils, especially plants. Tropical palms, figs, acacias, and myrtles seem during this period to have gradually given place to the more temperate poplar, hornbeam, and birch. The small three-toed horse *Anchitherium*, the earliest bear, *Hyænaretos*, the sabre-toothed tiger, *Machærodus* (q.v.), *Deinotherium* (q.v.), and *Mastodon* among proboscideans, with the rhinoceros, deer, and true apes are the most characteristic mammals of the Miocene.

Mirabeau, HONORÉ GABRIEL RIQUETTI, COMTE DE (1749-91), one of the greatest of French statesmen, was educated for the army at a Paris *pension*, and here he already began to display those social gifts which, in spite of his ugliness, gave him an almost miraculous power over the wills and affections of men. On obtaining his commission he was sent to the little town of Saintes, where he became entangled in the first of his disastrous love affairs, and was in consequence imprisoned by *lettre de cachet* (q.v.) in the Île de Ré. His father relented after a while, and allowed him to join the expedition to Corsica against Paoli. After his return he consented to marry a rich heiress (1772); but his extravagance and unruly conduct caused a fresh estrangement, and he was imprisoned successively in the Château d'If and the castle of Joux, where he formed a connection with the wife of a citizen of Pontarlier, with whom he fled to Switzerland, and thence to Holland; but in 1777 he was seized and condemned to solitary confinement in the castle of Vincennes. Here he wrote his brochure on *Lettres de Cachet*, a far more powerful work than the previous *Essai sur le Despotisme* (1774). After his release (1780), failing to obtain a restitution of his conjugal rights, he formed a new connection with a Madame de Nehra, who seems to have exercised a wholesome influence over him. He now turned to literature as a means of gaining a livelihood, and visited Holland and England, where, through his old friend Sir Gilbert Elliot (afterwards Lord Minto), he became intimate with Romilly, Lord Lansdowne, and other public men. In 1786 he was sent on a secret mission to the Prussian court, and while there obtained materials for his *Monarchie Prussienne* (1788). In 1789 the States-General was summoned, and the Revolution began. Mirabeau was elected deputy by the *tiers-état* of both Aix and Marseilles, and preferred to sit for the former. His rhetorical powers at once gained

him a hearing in the Assembly; but his ascendancy, though great, was not paramount. He could not check the reckless enthusiasm which found vent in the destructive legislation of August 4th, or raise the apathy which was content to waste two precious months in discussing the wording of the "Declaration of the Rights of Man." Soon after the disturbances of October 5-6 he was invited by his friend the Count de la Marck, a trusted counsellor of Marie Antoinette, to draw up a *Mémoire* for the king's guidance. In this document his constitutional views were clearly set forth, but Louis could not understand his aims. The queen was averse to any course which seemed to threaten a limitation of the royal prerogative, and his design of a representative ministry was frustrated by a decree of the Assembly enacting that none of its members could become a minister (November 7). Five months later, however, the queen again sought his advice, and from this time forward he occupied an unofficial and anomalous, but recognised position at court, although the queen always disliked him and only had recourse to his counsel as a last resort. His support of the king's prerogative in regard to the veto and right of declaring peace and war did not increase his popularity; but his influence in the Assembly remained sufficiently strong to afford a very substantial bulwark of the royal power. He was the real author of the foreign policy of Montmorin, the purpose of which was to prevent all interference with the course of the Revolution on the part of foreign nations. But towards the end of 1790 his health, undermined by his youthful excesses, gave way, and he died on April 2, 1791.

Miracle, a wonderful occurrence or phenomenon. In theology, a manifestation of superhuman power, producing an effect which cannot reasonably be assigned to ordinary human agency or to any known natural cause. In the Middle Ages dramatic spectacles illustrative of Bible history were called miracles or mysteries.

Mirage, an optical illusion produced by refraction when adjacent layers of air have very different densities, and are consequently very different refracting mediums. On flat deserts, when the air nearer the ground is rarer than the air above, such excessive refraction produces the appearance of objects reflected in water, the actual objects being often quite hidden below the horizon. The phenomenon occurs at sea as well as on dry, level plains. Objects may appear not only displaced, doubled, or simply inverted, but also distorted and turned over from a vertical to a horizontal position. Inferior mirage furnishes a visible object with a reflection as if it were in or near water.

Mirror, MAGIC. In China and Japan small mirrors are nearly always made of metal, highly polished, and often slightly convex on their reflecting face, and with figures or signs in relief ornamenting the back. Some of these mirrors are found to exhibit a curious phenomenon, when a beam of light is reflected from the face on to a white screen. A more or less distinct image of the carving on the back of the mirror is produced. Such mirrors were termed "magic," and

have been for many centuries prized far more than the ordinary reflectors in those countries. This peculiarity has been found to be due to an irregularity in the convexity of the front face which is produced in the process of manufacture. The metal on the front face is cut by a tool which is not equally resisted by all parts of the mirror, the thin portions where there is no relief ornament bending in front of the tool, and then afterwards rebounding into a rather more convex form than the thicker parts assume. A strong beam of light is therefore unequally reflected from the different portions, and an image appears on the screen. It has further been found that if a mould be taken of the face of the mirror, and this be coated electrically with a thin piece of metal, the polished metal surface of the mould will throw the same image on the screen, proving that the face of the mirror is unevenly curved.

Miscarriage, the premature expulsion of the ovum occurring during the fourth, fifth, sixth, and seventh months of pregnancy. If pregnancy is interrupted and the ovum expelled during the first three months, the term *abortion* (q.v.) is used to denote such occurrence, while the expression *premature labour* is employed to designate the expulsion of the contents of the womb after the seventh, and before the ninth month of pregnancy. Any cause which produces death of the fœtus leads to miscarriage; such causes are injury, disease of the decidua or of the foetal appendages, and separation of the decidua from the uterine walls. Again, miscarriage may result from a diseased condition primarily affecting the mother, such as certain fevers, syphilis, anæmia, etc. The symptoms of a threatened abortion or miscarriage are pain and hæmorrhage. If these symptoms occur in the course of pregnancy absolute rest in the recumbent position should be at once enforced, and professional advice procured without delay. Treatment of inevitable abortion is, of course, a matter for the medical attendant.

Misdemeanour is an act committed, or omitted, in breach of a law forbidding or commanding it. Crimes and misdemeanours are, however, comprehended under this general definition, though the former term "crimes" denotes such offences as are of a more serious and atrocious nature, while lesser faults and omissions are known by the milder term misdemeanours. In English law the term "misdemeanour" is used in contradistinction to felony, and comprises all indictable offences not amounting to felony—such as libels, conspiracies, attempts and solicitations to commit felonies, etc. [FELONY.]

Miserere, the name taken from the first word of the *Vulgate* of the fifty-first Psalm, used as a canticle in various liturgies, as in the Anglican and Latin burial services. Also a setting of this psalm to music—the most celebrated being that of Allegri—which is regularly performed in the Sistine Chapel at the Tenebræ service in Holy Week. The name is also given to a certain class of seats in church stalls.

Misericordia, the goddess of mercy or pity in post-classical Latin mythology.

Mishmi, a Tibeto-Burman people in the Mishmi Hills about the frontiers of Assam and Tibet, forming three main divisions: Midhi, Dagaru, and Meju, collectively called Nahong by the Tibetans. One group presents a striking resemblance to the Japanese lower classes, but all speak the same language, a rude, uncultivated Tibetan dialect, and most of the tribes have the flat features and yellowish colour common to all Mongolic peoples. Their religion is concerned mainly with the magic arts, and their priests, like the Siberian Shamans, exorcise the possessed and cure all ailments by their spells, contortions, dances and drum-beating. They are polygamists, and dwell in immense houses large enough to contain over a hundred persons under a single roof. In the barter trade everything is reckoned by the "head"—a reminiscence of the head-hunting period, when the heads of their victims served as currency. (T. T. Cooper, *The Mishmi Hills*; Dalton, *Ethnology of Bengal*.)

Mispickles, or ARSENICAL PYRITES, is a hard silver grey mineral which forms crystals of the rhombic system. It consists chemically of iron, sulphur, and arsenic (Fe_2AsS_2), but frequently contains also cobalt. It is used for the production of arsenic and arsenical compounds, being the chief source of these substances.

Missal, a mass-book in the Latin liturgy, consisting of a collection of several service-books. The greater portion of the contents is very ancient. The Roman Missal in its present form is substantially the Missal as revised under Pius V. and promulgated by him in 1570.

Missions, systematic expeditions or establishments for the spread of Christianity authorised by an ecclesiastical officer or a religious society. Celebrated missions are the sending of Augustine to England by Gregory the Great (597), the Jesuit missions in India, China, Japan, and South America, the missions of the Moravians or United Brethren, those of the Society for the Propagation of the Gospel in Foreign Parts (incorporated in 1698), and of the Church Missionary Society (established by the "Clapham sect" (q.v.), the nucleus of the Evangelical Party, in 1800). The term is applied also to a set of special services held occasionally for the awakening and comforting of baptised Christians under the conduct of a "missioner."

Mississippi. A river of North America, 2,960 miles in length, or, if the Missouri rather than the Upper Mississippi be regarded as the head-stream, 4,200 miles. With the exception of about 12,000 square miles drained by the Milk river and situated in British America, its basin of 1,257,545 square miles lies wholly within the United States. It rises in the state of Minnesota in lat. $47^\circ 6' \text{ N.}$, long. $95^\circ 15' \text{ W.}$ where several small streams unite to form Lake Itasca. It flows generally south, with a slight inclination towards the east; but in some parts its course is so involved that it almost returns upon itself. Its chief tributaries besides the Missouri (q.v.) are the St. Croix, Chippeway, Wisconsin, Illinois, and Ohio on the east, and the Minnesota, Iowa, Des Moines, Arkansas, and Red

River on the west. At first it passes, with numerous falls and rapids, through a wild and almost unexplored region of prairie, swamp, and pine-forest. In Wisconsin begin the bluffs which henceforward

frequently line its course, and below the influx of the Ohio sometimes rise abruptly to a height of 250 feet on the east bank; on the west bank they are less precipitous, and situated at a greater distance from the river, owing to the alluvial deposits brought down by the tributaries on this side, which form a plain varying from 30 to 150 miles in width. Below the Red River the stream divides into numerous channels, which find their way to the Gulf of Mexico through a marshy and



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MAP OF THE COURSE OF THE MISSISSIPPI.

perfectly level district with but few inhabitants. New Orleans is situated near the mouth. The main channel is entered through several mouths at the end of a long tongue of land in long. 89° W. The floods produced by the spring rains and the melting of the snow in the upper basin extend from February to June. The surrounding country is now protected by embankments called "levees;" but between the Ohio and the Red River they are broken through at intervals of about ten years, when the water sometimes rises 50 feet, and the river frequently shifts its course permanently for some distance. In some places the surface, but not the bed of the river, is higher than that of the land in the neighbourhood. The Mississippi is navigable as far as Minneapolis, 2,160 miles above its mouth. The chief dangers of navigation, in addition to those caused by the falls and rapids (now averted by the construction of ship canals) are the "snags" and "sawyers," or trees carried down by the floods, and the vast deposits near the mouth which are constantly shifting their position; but a fixed channel, over 30 feet deep, is now secured through the jetties designed by Captain J. B. Eads.

Mississippi is the name of one of the United States, having Tennessee on the N., Alabama on the E., Arkansas and Louisiana on the W., Louisiana and the Gulf of Mexico on the S.; area 46,810 square miles. The Mississippi river skirts the west

border. A level tract, in which swamps alternate with prairies and pine-forests, stretches inland for 100 miles from the coast; elsewhere the surface consists for the most part of low hills or plateaus, except in the Yazoo Delta, which extends N. from Vicksburg to the borders of Tennessee. The greater part of the delta is now protected from the floods by levees, and that portion of it which has been taken into cultivation has proved exceedingly productive. The state contains much good pasture land, especially in the N.E. district. The products are exclusively agricultural, the chief being cotton, corn, and oats. In the south fruit and vegetables are grown largely for foreign consumption; and another important export is timber, which is prepared in the saw-mills on the Pascagoula and the Pearl. This state, originally part of the French colony of Louisiana, belonged to Great Britain since 1763; it was admitted into the Union in 1817.

Missolonghi, a Greek seaport of modern origin, situated on a swampy plain in the nomarchy of Ætolia, 24 miles W. of Lepanto. It was twice besieged by the Turks in the course of the War of Independence. During that struggle Lord Byron (q.v.) died here of fever (1824).

Missouri ("Great Muddy"). The real head-stream of the Mississippi; it is formed by the junction of the Jefferson, Madison, and Gallatin, which flow N. from the Wind River Mountains, on the borders of Wyoming and Idaho, and unite at Gallatin city, Montana, in lat. 45° 54' N., long. 111° 30' W. Its course thence is N. as far as Fort Benton (about 200 miles), whence it trends towards the E. About 90 miles beyond Gallatin city it passes through the "Gate of the Mountains," a magnificent gorge nearly six miles long, with precipitous cliffs of granite (1,200 feet in height) on either side. At the Great Falls, 60 miles below the Gate, the river descends 327 feet in 15 miles, the highest single fall being 87 feet. From Fort Benton it flows E. through Montana and part of Dakota, then S. and S.E. through Dakota and between Iowa and Missouri on the left, and Nebraska and Kansas on the right, as far as Kansas city, where it turns E., joining the Mississippi 20 miles above St. Louis. Its chief tributaries are the Yellowstone, Platte or Nebraska, and Kansas, all on the right bank. The river can be ascended to Fort Benton, or, in the dry season, to the Yellowstone; but navigation is dangerous, and has to be almost completely abandoned in favour of railway communication. The waters of the Missouri are turbid, and it has a swift current. The total length is 3,047 miles.

Missouri is the name of one of the United States, having Iowa on the N., Nebraska, Kansas, and Indian Territory on the W., Illinois, Kentucky, and Tennessee on the E., Arkansas on the S.; area 69,415 square miles. The Mississippi forms the eastern boundary. The state is divided into two unequal portions by the river Missouri, that on the south side being much the larger. North Missouri is for the most part level or gently undulating, but to the south of the river the surface is more varied, the Ozark Mountains (1,500 feet) forming a break in the vast expanse of rolling prairies. In the S.E.

there is a tract of marshy and very fertile land, formed by the subsidence of the soil in the earthquakes of 1811-12. The most important crop is maize; but oats, wheat, potatoes, hemp, sorghum, and tobacco are also grown in large quantities. The raising of live stock for foreign consumption is now a growing industry. Missouri is rich in coal, iron, zinc, copper, lead, nickel, and other mineral products. In the north and centre there is a very extensive coalfield extending into Kansas and Iowa. Iron ore is found chiefly S. of the Missouri, especially in the S.E. Jefferson city is the state capital; but by far the most important town is St. Louis, a centre of great commercial and manufacturing activity. Missouri was constituted a territory in 1812, and admitted to the Union in 1821.

Mistletoe (*Viscum album*), an interesting parasitic plant, belonging to the order Lorantheæ, the only species of its genus which is a native of Europe. It forms an evergreen bush, sometimes four feet long, with a woody stem, repeatedly and dichasially branched, and having no cork but a persistent epidermis. The yellowish-green leaves are sessile, leathery, in opposite pairs, and obovate in form. The small flowers are diœcious, and appear in February or March. They have four perianth-lobes, the anthers in the male flowers being epiphyllous and opening by numerous pores. The fruit is a pearly transparent berry, full of viscid pulp, and containing one adherent seed, destitute of a testa. The seed often contains two embryos. The berry is eaten by many birds, especially the mistle-thrush, and from their beaks the seeds are rubbed into cracks in the bark of trees. The roots of mistletoe graft themselves into the sap-wood of many trees, especially the apple, poplar, lime, and hawthorn, rarely on the oak, but occasionally on cedars and firs. Less than twenty mistletoe-oaks are known in England, nearly all of them in Herefordshire. Jack-in-the-Green's May-day garb of boughs is said to be a relic of that worn by Druids when searching for a mistletoe oak, round which, when found, they are said to have danced singing "Hey derry down," or "In a circle move we round the oak." Pliny describes how the white-vested arch-druid cut the plant with a golden sickle and distributed it as an all-healing remedy. Its downward growth long led to its use as a cure for giddiness. The origin of its modern use is somewhat obscure. Many tons are annually brought to London from Herefordshire, Worcestershire, Gloucestershire, and Normandy.

Mistral, in southern France and the adjacent districts, especially in the Rhone valley, a strong, cold, and dry wind from the north-west.

Mistral, FRÉDÉRIC (b. 1830), a French poet, whose success as a writer in the ancient and beautiful *langue d'oc*, the resources of which had already been shown by Jasmin (q.v.), has been followed by the rise of quite a large group of Provençal bards. The Provençal language, now a mere dialect, was Mistral's native tongue, for he was born (the son of a peasant), near Maillanne, in the department of Bouches-du-Rhone. His epic poem *Mirèio* (1859) has been ably translated by

Miss Harriet Preston. He also wrote *Calendon* (another epic), *Lis Iselo d'Or* (a volume of poems), *Nerto* (a novel), and a Provençal dictionary.

Mitchel, JOHN (1815-75), Irish revolutionary leader, was the son of a Presbyterian minister at Dungiven, in county Londonderry. He was educated at Trinity College, Dublin, and became a solicitor. From 1845 to 1847 he edited the *Nation*, but resigned his post to start the *United Irishman*, in which he advocated a policy of physical force. He was in consequence convicted of treason-felony, and transported to Van Diemen's Land (1848), whence he escaped to the United States (1853). In 1874 he returned to Ireland, but a petition was lodged against the return, and Mitchel died before the matter was decided. He published a *Life of Aodh O'Neil* (1845), and other works.

Mitchell, SIR ANDREW, was born in 1757, and after having served under Commodore Sir Edward Vernon in 1778, was made a post-captain. He attained flag-rank in 1795, and became a vice-admiral in 1799. In that year, as second to Lord Dunearn, he commanded the expedition to Holland, and took possession of the Dutch fleet in the Texel. For this service he received the thanks of the House of Commons and a K.B. He afterwards held a command in the Channel fleet, off the coast of Ireland, and at Halifax. He was made an admiral in 1805, and in the following year died at Bermuda.

Mitford, MARY RUSSELL (1786-1855), the authoress of *Our Village*, a delightful series of sketches depicting English country life in the early years of the century, was born at Alresford, in Hampshire, where her father practised as a physician. In consequence of his extravagance they were obliged to settle in a small cottage at Three Mile Cross, near Reading, and here she supported herself and her father by writing dramas for the London stage. The papers contained in *Our Village*, after appearing in the *London Magazine*, were published separately (1824-30). *Atherton*, a novel, appeared in 1854.

Mitford, WILLIAM (1744-1827), historian, was the son of a country gentleman in Hampshire. He entered Parliament in 1783. His ample means enabled him to spend 30 years in the composition of a *History of Greece* (1780-1818), which is now little read but by no means forgotten. It is marked by all the prejudices of a bigoted Tory partisan.

Mithradates Eupator, or THE GREAT (sometimes incorrectly spelt *Mithridates*), (circa 132-63 B.C.), succeeded his father about 120 B.C., and soon became master of the shores of the Euxine as far as the Tauric Chersonese. In 88 B.C. an invasion of the King of Bithynia, who had been incited by the Romans to attack Mithradates, gave rise to the first Mithradatic War. Mithradates rapidly gained possession of the neighbouring kingdoms, and overran the Roman province of Asia; but he was expelled from Pergamus by C. Flavius Fimbria in 85, and in 84 Sulla forced him to restore his conquests and pay a large indemnity. In the course of the second Mithradatic War (83-81) Mithradates

greatly strengthened his position in Asia. He brought about the third Mithradatic War by his invasion of Bithynia (74), in which he was aided by certain Romans favourable to the cause of Marius. After some successes he was forced by Lucullus to seek refuge with Tigranes of Armenia (72), and in 68 the same general defeated both kings in the battle of Artaxata. The war was brought to a close by Pompey, who defeated him on the Euphrates near the Armenian border. Mithradates now withdrew to the Cimmerian Bosphorus. Three years afterwards he killed himself at Panticapæum (Kertch), to escape falling into the hands of his rebellious son, Pharnaces.

Mithras, the sun-god of the Zoroastrian system, eventually identified with the Supreme Being. He was supposed to intervene between Ahriman (q.v.) and Ormuzd.

Mitrailleuse, a breech-loading machine-gun, consisting of a number of small barrels bound together and so arranged as to be capable of continuous fire for short periods. The original mitrailleuse was the invention of a Frenchman named Montigny, and was expected to play a very important part in the Franco-German War of 1870. It failed, however, to produce much effect. More perfect weapons of a similar kind have been invented by Gardner, Hotchkiss, Nordenfelt, Gatling, and others.

Mitre, a sacerdotal head-dress conferred by the Pope as a distinction on cardinals and certain prelates and abbots. The present form is a lofty cleft cap, rising from a coronet. It is now regarded as an attribute and symbol of bishopric, and is occasionally worn by a few Anglican bishops. There are three kinds of mitres, the mitre of precious metal, the auriphrygiate, and the cap of silk or fine linen. The head-dress of the Jewish high priest is called a mitre. The origin of this cap of dignity seems to be Oriental, and was perhaps derived from an article of female attire.

Mitscherlich, EILHARD (1794–1863), German chemist, was born near Jever, in Oldenburg. Whilst a student at Heidelberg (1811–13) his attention was devoted chiefly to Oriental languages, and he conceived an ardent desire to visit Persia. To promote this end he resolved to study medicine, and whilst thus engaged became so interested in the science of chemistry that he abandoned his original intention. The theory of isomorphism was worked out by him in 1819. He became extraordinary professor of chemistry at Berlin in 1822, and ordinary professor in 1825. His chief book was *Lehrbuch der Chemie* (1829–35).

Mivart, ST. GEORGE, F.R.S. (b. 1827), man of science, was educated at Harrow, King's College, London, and the Roman Catholic College of St. Mary, Oscott. He was elected vice-president of the Zoological Society in 1869 and 1882, and of the Linnæan Society in 1880. His works include *The Genesis of Species* (1871), combating Darwin's theory of "natural selection," *The Cat* (1881), an introduction to the study of backboneed animals, and *On*

Truth (1889), in which he demonstrates the foundations of scientific knowledge.

Mixtecs, one of the civilised peoples of Mexico, whose territory (Mixtecapan) occupied the present states of Oajaca, Puebla, and Guerrero—that is, a large part of Central and South Mexico. It comprised a great number of petty states, all of which recognised the suzerainty of a lord paramount, who was one of the most potent allies of the Aztecs. The present Mixtecs, although Roman Catholics, still speak the old national language, which is radically distinct from Aztec, and of which there are several well-marked dialects, such as the Tepuzculan and Zapotec of Oajaca, the Chocho of Puebla, and the Amusgo of Guerrero.

Moabites, an ancient Arabian tribe which inhabited the highlands E. of the Dead Sea, and S. of the river Arnon, or Wady Mojib. They were said to be descended from Lot. They reduced the Israelites to subjection for eighteen years during the period of the Judges, were made tributary by David, and disappeared as a separate tribe after the Babylonish captivity.

Mobile, the most populous town of Alabama, U.S.A., is situated on the Mobile river, at the head of Mobile Bay, an inlet of the Gulf of Mexico. The harbour admits vessels drawing 13 ft., and there are a floating dry-dock and several shipyards. The cotton trade has declined since the Civil War, but the export of timber is of growing importance. Many of the inhabitants are of Spanish descent.

Mobilier, CRÉDIT, a large banking and financing company formed in Paris in 1852, which has been repeatedly reorganised and has considerably reduced its capital in the process. Its object was to lend money on the security of property other than real property [CRÉDIT FONCIER], and to "finance," or take shares in, industrial companies, railways, etc.

Mocking Bird (*Mimus polyglottus*), an American thrush-like bird ranging from 40° N. to Mexico. The length is about ten inches, the plumage, brown above, white on the under-surface. It is much valued as a cage-bird, owing to its vocal powers, which, in imitative notes and natural song, are said to exceed those of any other species.

Mocobi, a warlike South American nation, who still maintain their independence in the Argentine provinces of Gran Chaco and Santa Fé; they are hereditary foes of the Tobas, although both of these powerful nations have a common origin and speak dialects of a common stock language. By Brinton (*American Race*) they are regarded as members of the Guaycuru family.

Modena (anc. *Mutina*), a town of north Italy, capital of the former duchy of the same name, 23 miles N.W. of Bologna by rail. It is situated on a broad plain between the Panaro and Secchia, which are here joined by a canal. The cathedral, a Romanesque building, with a handsome façade and a lofty campanile, was begun in 1099. The ducal palace—a noble pile erected in the 17th century, with splendid courts surrounded by colonnades—contains a library

of 90,000 volumes and 3,000 MSS., a gallery of paintings, and many interesting monuments of antiquity. The university was founded in 1678. Leather and silk goods are manufactured. The origin of Modena dates back to the days of the ancient Etruscans, from whom it was conquered by the Gauls, before passing into the hands of the Romans. It was made the capital of a county by Charlemagne, and was ruled by the family of Este from the 13th century to their final expulsion in 1860. Since that date it has formed part of the kingdom of Italy.

Modjeska, HELENA, Polish actress, born at Cracow in 1844, adopted acting as a profession in 1862. In 1876 she emigrated to America with her second husband, Count Chlapowski, and in the following year appeared at San Francisco as *Adrienne Lecouvreur*, the rôle which had made her reputation at Warsaw nine years earlier. Her acting excited the greatest enthusiasm in America, and she has also been well received at several London theatres.

Modulation, in music, the science of the correct and appropriate sequence of tones and harmonies in a melody. The composer is instructed by this study to choose tones (except such as are only used in passing) which belong to the key he is assuming, and how to proceed from one key to another, finally returning to the fundamental key.

Modulus of a material is a measure of its elasticity (q.v.) when its length, volume, or shape is altered, the respective moduli being those of length, bulk, or rigidity. The modulus is the ratio of the stress to which the material is subjected, to the strain, or proportionate deformation produced. If 10,000 lbs. per square inch will extend a bar 7 inches long to the extent of $\frac{1}{100}$ th of an inch, the stress is 10,000, the strain $\frac{1}{100}$, and the modulus of elasticity of length $10,000 \div \frac{1}{100} = 7,000,000$ lbs. per square inch. [LOGARITHMS.]

Moesia, in classical geography, was a region to the south of the Danube, corresponding pretty closely to the modern Servia and Bulgaria. The original inhabitants, probably Thracians, were subdued by a body of Celtic invaders in B.C. 277. The Roman province, formed in the reign of Augustus, was subsequently divided into two—Moesia Superior (Servia), and Moesia Inferior (Bulgaria)—probably soon after the accession of Trajan. The Goths first appeared in Moesia in 250 A.D.; the Visigothic settlement took place under Valens in 376. The irruption of the Slavonians and Bulgarians began in the 5th century and continued till the 7th century.

Moffat, ROBERT (1795–1883), missionary, was born at Ormiston in East Lothian. In 1816 he was sent to South Africa by the London Missionary Society, and travelled northwards to Afrikaner's kraal; he afterwards removed to Griqualand. In 1819 he married Miss Mary Smith, who greatly assisted his efforts. After various wanderings through the neighbouring regions he settled at Kuruman in Bechuanaland (1826), which henceforward became his head station. Here, with the exception of a visit to England in 1838–43, he

remained till 1870, preaching the Gospel and translating the Bible into the Sechwana language. His daughter married David Livingstone.

Mogador, or SUERRAH, a seaport on the Atlantic, 130 miles W.S.W. of Morocco. It is situated on a promontory which consists of sand-hills towards the land, but becomes rocky as it juts into the sea. The harbour lies between the promontory and an island. It was built in accordance with the plans of Cornut, a French engineer (1760). Nearly half the inhabitants are Jews. Exports include almonds, olive-oil, ostrich-feathers, gums, goat-skins, and esparto grass.

Moghul (properly MUGHAL), the Arabic, Persian, and Indian form of *Mongol*, applied especially to the chief Mongolian tribe in the Chagatai steppe, thence known as *Moghulistan*. Later the term passed into India with Sultan Baber, who, as a descendant of Jenghis Khan, was a reputed Mongol, and founder of the Moghul Empire; but his descendants, the "Great Moghuls," had very little Mongol blood in their veins, while most of his followers were rather of Turki (Tartar) than Mongol descent. Of the Chagatai Moghuls the chief divisions were the Doghlats, Khiras, Konchi, Begchaks, and Tekrits, now best represented by the Uzbegs of Bokhara. [CHAGATAI.]

Mohair, the woolly hair of the Angora goat of Asiatic Turkey. Though known since 1655, this product was little used in Western Europe until 1820. The goat has been successfully acclimatised in the dry plateaus of Oregon, California, Cape Colony, and Australia. We import upwards of 20,000,000 pounds of mohair annually, nine-tenths of this amount through Constantinople, and most of the remainder from Cape Colony. The fibre may be four or five inches long, white, lustrous, elastic, and durable, and is used in making plush, Utrecht velvet, imitation fur and ostrich feathers, braids, and boot-laces.

Mohammed, or MAHOMET (Arab. *Muhammad*, "the praised one"), the founder of Islam, was born at Mecca about 570 A.D. Both his parents belonged to the Koreish, a tribe which claimed direct descent from Ishmael, and had charge of the Kaaba (q.v.) and other sacred spots. After the death of his father (which perhaps preceded his birth), his mother, and his grandfather, he passed in his ninth year under the tutelage of his uncle, Abu Tâlib. At the age of twenty-four he left Abu Tâlib's house to enter the service of the wealthy widow Khadija. He was sent in charge of her goods on a mercantile journey to Syria, where he renewed his acquaintance with the Jewish and Christian religions, of which he had already gained some knowledge during a similar expedition with his uncle thirteen years before. Soon after his return he became the husband of Khadija, who was now about forty years of age, and with her he lived a happy domestic life during the next fifteen years. As he was meditating one day in a cavern on Mount Hira, an angel appeared to him in a vision, and spake mysterious words concerning the Beneficent Lord who had created man. After a while

the angel visited him again, bidding him "arise and preach," and from this time he felt assured of his divine mission. The faithful Khadija was the first to believe in him; his next converts were his adopted children Ali and Zaid, and his friend Abu Bekr; others speedily followed, and soon he had gathered round him a band of fifty disciples, composed of his kinsmen and his closest friends. Most of the Koreish, indeed, viewed his proceedings with scorn; but it was not till the fourth year of his mission, marked by the opening of a sort of school opposite the Kaaba and a great increase in the number of his followers, that the people of Mecca became seriously alarmed. In the sixth year of his mission the accession of the fierce Omar greatly strengthened his cause, and the increasing boldness of himself and his followers led to the formation of a confederacy among the Koreish, by which he and his family were for a time placed under a ban. Four years later Khadija and Abu Tâlib died, and Mohammed, convinced that the cause would never prosper at Mecca, determined to seek a home for the true believers elsewhere. The rapid conversion of a number of pilgrims from Medina pointed to that city as the fitting spot, and thither the Moslems gradually removed in small bands, followed at last by Mohammed himself, probably on April 19, 622. [HEGIRA.] The emigration led to a great change in the character both of Mohammed himself and the religion which he taught. Hitherto known only as the leader of a despised sect, he suddenly became ruler over a city and two powerful tribes. As a result of this access of worldly power the functions of the prophet were now, to some extent, merged in those of the warrior, legislator, and judge. The inspired utterances in which he declared the will of God [KORAN] became less imaginative and emotional, but gained in precision and practical force. He had begun to regard his mission in a new light; he was to be not merely a moral reformer, but the founder of a new religion and polity, which should be spread by fire and sword throughout the world. For several years his arms were directed only against the Meccans and the Jews who abounded at Medina and in various districts of Arabia. A great victory over the Koreish was gained at Badr in 2 A.H., and, although he was defeated a year later, his expeditions against the Jews were so successful that in 7 A.H. the Meccans thought it prudent to conclude a truce with him for ten years. In consequence of this arrangement he was able to perform the pilgrimage to Mecca in 8 A.H. Shortly afterwards a violation of the terms of the truce gave him a pretext for attacking the town. Its surrender (630 A.D.) was followed by the gradual submission of the Arabs in every part of the peninsula, who acknowledged both his spiritual and temporal authority. He died whilst he was making preparations for an attack on the Syrian possessions of the Byzantine Empire, and was succeeded by Abu Bekr, his first convert outside his own family. The notion that Mohammed was a vulgar impostor has long since given way to more rational views, and it is now generally conceded that, making allowance for the circumstances of his country and age, he

must be regarded as one of the most earnest reformers and civilizing teachers who have appeared among mankind.

Mohave (MOJAVE, but properly AMAKWAKWA), North American Indians, an important branch of the Yuman family, who had formerly numerous settlements in Upper California, and especially about Fort Mohave on the Colorado river 400 miles above its mouth. They reached northwards beyond Hardyville, where they were conterminous with the kindred Chemehuevi. At present (1893) they are reduced to 1,830 persons, of whom 640 are in the Colorado River Agency, Arizona, 790 in the San Carlos Agency, and 400 in Arizona under no agency.

Mohawks, North American Indians, one of the six nations of the Iroquois confederacy, whose original seat was in the valley of the Mohawk River, state of New York. The Mohawks took a leading part in the affairs of the confederacy, and were renowned for their eloquence in the public assemblies, and for their valour on the battle-field. After the War of Independence nearly all the Mohawks passed into Canada, where they still number 2,350, of whom 1,300 are settled on Grand River, and 1,050 at Quinte Bay, Ontario. A mere handful remain in New York, grouped with other tribes in the Tonawanda and Onondaga reserves.

Mohicans (MOHEGANS), North American Indians, members of the Algonquian family, who, jointly with the Massachusetts and Narragansetts, occupied the region between the Hudson River and the Atlantic, being conterminous northwards with the kindred Etchemin and Abenaki tribes; they are immortalised by Fenimore Cooper in *The Last of the Mohicans*. Although supposed to be long extinct, the census of 1880 returned a few calling themselves Mohicans in several counties of Connecticut, especially in New London and Norwich.

Mohilev, or MOGHILEV, a government of West Russia, with an area of 18,551 square miles. The surface is flat. Much timber is exported hence through the Black Sea ports. MOHILEV, the capital, is situated on the Dnieper, 95 miles S.W. of Smolensk. It is a bishopric, both of the Greek and Roman Catholic Churches. Tanning is carried on, and there is a large general trade. The Russians were defeated here by Davoût in 1812.

Mohl, JULIUS (1800-76), Orientalist, was born at Stuttgart and studied theology at Tübingen. His love of Oriental learning drew him to Paris (1823), where he studied Arabic and Persian under De Sacy, and Chinese under Abel Rémusat. He became professor of Oriental languages at Tübingen in 1826, but passed most of his time in Paris. In 1847 he was appointed professor of Persian at the Collège de France. His chief work was his monumental edition of the *Shah Nameh* of the Persian poet Firdausi. His annual reports to the Société Asiatique, which afford a valuable survey of contemporary research, were collected and edited by Mme. Mohl (*née* Clarke), herself a literary lady of the highest eminence, whose *salon* was a centre of thought and refinement.

Möhler, JOHANN ADAM (1796–1838), an able Roman Catholic polemical theologian, was born at Igersheim, in Würtemberg. He studied theology at the university of Tübingen, and became professor there in 1828. His chief work, *Symbolism: or, the Doctrinal Differences between Catholics and Protestants* (1832), gave rise to much controversy.

Mohmands, a large division of the Afghan nation, who occupy the hills N.W. of Peshawar between the Kabul and Swat rivers. There are seven main groups—Tarakzai, Halmizai, Baizai, Kwaizai, Utmānzai, Dawezai, and Kukazai, with 63 Khels.

Moire, a kind of watered silk, so named after watered mohair (q.v.). Moire antique is silk watered so as to resemble antique fabrics.

Mokanna, HAKIM BEN ALLAH ("the Veiled prophet of Khorassan"), so called from the veil which he had flung over his features

"To hide from human sight
His dazzling brow, till man could bear its light."

Mokanna claimed to be an incarnation of the Divine Being, and became the leader of a numerous sect, but was finally defeated by the Kalif Almahdi, and took poison to escape a worse fate (780 A.D.).

Molasses, the coloured, saccharine mother liquor which remains uncrystallised during the crystallisation of sugar. [SUGAR.]

Moldau, a river of Bohemia, 278 miles in length. Its source is in the Böhmerwald Mountains in lat. 49° N., at an elevation of 3,870 feet above the sea. It flows S.E. for 50 miles, and then curves N., joining the Elbe at Melnik, 21 miles after passing Prague.

Mole, a breakwater of rubble or masonry stretching across a port or harbour.

Mole, any individual of the insectivorous genus *Talpa*, type of the family *Talpidae* (with eight genera, containing nineteen species), from the Nearctic and Palaearctic regions. The type-genus (with eight species) has the range of the family. The best known of these, the Common Mole (*T. europæa*), is found all over Britain, but is absent from Ireland and the western islands of Scotland. In Europe it is widely distributed, and ranges eastward nearly as far as China. This little burrower is about six inches long, of which the scaly tail counts for one inch; the body is elongated and cylindrical; the wedge-shaped head terminates in a sharp snout, well-fitted to bore into the earth; the fore limbs are short and muscular, and the palms directed outwards form shovel-shaped organs admirably adapted for digging. The breadth of the palm is increased by a sickle-shaped bone projecting inwards from the wrist, and considered by some authorities to represent a lost first digit or prepollex. The hind feet are long and slender, and, like the hands, of a pale flesh colour. There is no external ear, the eyes are minute, and in the other species they are covered by a membrane. The fur is thick and velvety, generally black in colour, sometimes with a greyish

or brownish tinge; but a paler coloration is sometimes met with, and albino forms are recorded. The mole is a flesh-eater, and its favourite food consists of earthworms and insect larvæ. In confinement no kind of flesh comes amiss to it, and when pressed by hunger it has been known to attack lizards and frogs, and even to devour a weaker companion that shared its prison. It is



COMMON MOLE. (*Talpa europæa*.)

extremely voracious, and requires a constant supply of food; indeed, a fast of twelve hours is said to be fatal to it. For the greater part of the year moles are solitary. Pairing takes place in the spring, and the female brings forth her young, generally four or five, in a separate chamber, usually at some distance from the "fortress," as it is the fashion to call the mole's dwelling. This admittedly consists of a central chamber, from which lead passages or runs, along which the animal goes on his hunting expeditions. But it may be doubted whether the symmetrical galleries described by Le Court, whose figures have been copied into most books on natural history, are of frequent occurrence. Mole-hills appear to be thrown up by the animal when hunting, or in pursuit of a mate. Moles are credited with doing a great amount of damage to lawns and fields, and are trapped in large numbers; but against the damage they do should be set the benefit to the farmer by the destruction of immense numbers of insect larvæ. The "blind" mole of Aristotle is *T. cæca*, from the south of Europe. America has two genera—*Scalops* (the Shrew-Moles), and *Condylura* (the Star-nosed Mole), with a ring of movable filaments, probably organs of touch, at the end of the snout.

Molé, MATTHIEU LOUIS, COMTE (1781–1855), a French statesman, whose ancestors had taken an important part in the disturbances of the Fronde, and whose father was President of Parliament in 1788. The son came to Paris after the Revolution, and made his *début* by an *Essai de Morale et de Politique*. Having defended Napoleon's Government, he was made Master of Requests, and in 1813 count and cabinet minister. Louis XVIII. made him peer of France and Minister of Marine in 1815, and under Louis Philippe he was for a

time at the head of Foreign Affairs. In 1836 he became Prime Minister. In 1836 he failed to get elected to the Assembly, and retired into private life, to come once more to the front through election to the Assembly after the Revolution of 1848.

Mole-Cricket (*Gryllotalpa vulgaris*, Linn.), is the largest and most voracious of British crickets. It lives in burrows made by the front legs, which are flattened out like those of the mole. Its voracity is extraordinary, and cases are recorded of the front half of one which has been cut in half attempting to eat the other half.

Molecule. A molecule may be defined as the smallest subdivision of any kind of matter which is capable of existing in the free state. This definition necessarily assumes that matter is not infinitely divisible, an assumption arrived at both from chemical and physical grounds. Each molecule is again built up of *atoms* (q.v.), the number, nature, and mode of union of the atoms varying with the various forms of matter known to us. In elementary substances all the atoms are of the same kind, and in most the molecule, in the gaseous state, consists of two atoms. The molecule of some elements, however, appears to consist of only one atom, *e.g.* mercury, zinc, etc., while in other cases, *e.g.* phosphorus, it is polyatomic. Our knowledge of the complexity of liquid and solid molecules is, however, extremely limited. The absolute size and weight of the molecules have formed the subject of a considerable amount of physical research. From the results, the diameter of a molecule is estimated at from $\frac{1}{100,000,000}$ to $\frac{1}{100,000,000}$ of a millimetre. A better idea may be derived by stating it bears the same ratio to an ordinary marble as a marble does to the earth. The determination of the relative weights of the molecules of substances when referred to that of hydrogen is an important quantity in chemical calculations and has to be calculated with great care. As, according to Avogadro's law, equal volumes of gases under similar conditions of temperature and pressure contain the same number of molecules, the determination of the vapour density of a substance forms the best method of finding the molecular weights. Frequently, however, the substance cannot be vaporised, and then other methods are employed. Chief among these is a method due to Raoult, which is dependent on the fact that when a weight of any substance is dissolved in a liquid which does not act upon it chemically, it lowers the freezing-point of the liquid to an extent dependent upon its molecular weight; a similar lowering of the vapour pressure of the liquid or production of an *osmotic pressure* (q.v.) may also be employed.

Mole-Rat, any individual of the family Spalacidae, burrowing rodents of mole-like form and habit, but feeding principally on roots. They occur in south-eastern Europe, are widely distributed over Africa, and less widely in Asia.

Molesworth, MRS. (MARY LOUISA STEWART), was born at Rotterdam, and passed the early part of her life successively at Manchester, in Scotland, and in Switzerland. She was educated partly by her mother, and partly by Mr. Gaskell, husband of

the novelist of that name. She embarked in literature at an early age, among her earlier works being *Lover and Husband*, *She was Young and He was Old*, *Cicely*, *Hathercourt Rectory*, and *Miss Bourverie*. She has also written much in magazines for the young, one of the most noted of her tales for children being *Carrots*.

Molesworth, SIR WILLIAM (1810-1855), 8TH BARONET, was born in London, and inherited estates in Cornwall and Devon in 1823. In 1832 he entered Parliament for East Cornwall, and supported the policy of Earl Grey, sitting later for Leeds from 1827 to 1841. In 1835 he had joined with Mr. Roebuck to start *The London Review*, which represented the views of those who were called "Philosophical Radicals." During a temporary retirement from public life, from 1841 to 1845, he edited the works of Hobbes. From 1845 to 1855 he represented Southwark in Parliament, and gave much attention to the question of our Colonies, which he made his special subject. In 1852 he became Commissioner of Public Works in Lord Aberdeen's Government, among the works carried out under his *régime* being the building of Westminster Bridge. In 1855 he was made Colonial Secretary, but did not live to carry out his views.

Molière, the father of French comedy (1622-73), was really named JEAN BAPTISTE POQUELIN. He was born at Paris, where his father was upholsterer to the king. After the death of his mother in 1632, and the remarriage of his father the following year, Molière went to the Collège de Clermont, which he left in 1641. He had a taste for philosophy, and at college he became imbued with the ideas of the Aristotelian system; but after coming to Paris he turned his attention to Lucretius and translated the *De Natura Rerum*. He then appears to have studied law; but in 1642 we find him acting as "valet tapissier" to Louis XIII., and in the next year he became a comedian, and made the acquaintance of the family Béjard, who had a great influence on his life, for one daughter, Madeleine, became his mistress or firm friend, and in 1642 he married another daughter of the family, Armande, whom, however, his enemies and calumniators (who were many) represented as being the daughter of his mistress Madeleine. He played for some years in different parts of France, and in 1653 produced at Lyons his first comedy, *L'Étourdi*. In 1656 his second comedy, *Depit Amoureux*, was produced at Beziers. Conti had patronised him, but, turning religious, threw over the actor, and even wrote against him at a later period. However, Molière had already made his mark, and in 1658 was commanded to play before Louis XIV. The next year appeared his *Précieuses Ridicules*, afterwards expanded into *Femmes Savantes*. In 1660 appeared *Sganarelle*, and many other plays followed in rapid succession, among the best known of these being *Le Tartufe*, *Le Misanthrope*, *Festin de Pierre*, *Le Médecin malgré Lui*, *Georges Dandin*, *Le Bourgeois Gentilhomme*, *L'Avare*, *Le Malade Imaginaire*. He was a good actor, and played right up to the time of his death. Molière is one of the few earlier French writers who has found as great favour in

the eyes of foreigners as in those of his own countrymen. Molière is said to have read his plays to his housekeeper with a view to discovering how an audience would take them. His clerical enemies pursued him beyond the grave by denying his body Christian burial, but the king's insistence obtained for him this privilege.

Molina, LUIS (1535-1600), a Spanish Jesuit, who was born at Cuenca. He entered the order at 13, and studied theology at Coimbra, and then became a professor at Evora, and later taught moral theology at Madrid. His great work in life was the treatment of the question of free-will and predestination, and his endeavour to harmonise the theory of free-will with that of grace made a great commotion. The Dominicans vigorously attacked his position, and finally reference was made to the Pope, who cut the knot by imposing silence upon the combatants. Molinism passed finally into Jansenism, and is noticed by Pascal in his *Lettres d'un Provincial*. Molina also wrote a commentary upon part of the *Summa* of St. Thomas Aquinas.

Molinos, MIGUEL (1627-96), a Spanish theologian, was born at Saragossa, and educated at Pampeluna and Coimbra. Having taken orders, he went to Rome, where he achieved a great reputation as a director. In 1675 he wrote his *Spiritual Guide*, which displayed features of mysticism, verging towards what was called "Quietism." Now that his reputation was universally established he was attacked by the preacher Segneri on the ground that his system annihilated the will. The Jesuits joined in the attack, and in spite of the favour of Cardinal Odeschalchi (afterwards Pope Innocent XI.), the Jesuits opposed him, and in 1605 he was cited before the Inquisition, and called on to abjure his errors, and was committed to prison for life. One of the chief points objected to in his doctrines was the theory that "internal perfection" was compatible with external excesses.

Mollusca, one of the great groups or *phyla* of the animal kingdom. Molluscs live either on land or in fresh or salt water, and are very widely distributed. The following is the classification most widely accepted at present:—

Subphylum Lipocephala	Class Lamellibranchiata
„ Glossophora	„ Gastropoda
	„ Scaphopoda
	„ Pteropoda
	„ Cephalopoda

Moloch, MOLECH, an iron idol of the Ammonites on which children were burnt alive as sacrifices. It represented the chief god of the Phœnician mythology; also called *Milcom*.

Moloch Lizard, or THORN DEVIL (*Moloch horridus*), a small Australian agamid lizard, of grotesque appearance. The body is thickly set with spines in longitudinal rows, the tail and limbs are studded with them; and the head seems a miniature copy of that of the two-horned rhinoceros.

Moltke, HELMUTH KARL BERNHARD GRAF VON (1800-91), the most celebrated of modern generals, was the son of a captain in the Prussian army who afterwards became a general in the

Danish service. In 1833 he became lieutenant, and in 1835 captain. He afterwards went to Turkey, where he became military adviser of the Sultan Mahmud, and saw some service. Returning to Berlin after the death of Mahmud, he embodied his Eastern experiences in *The Russo-Turkish Campaign of 1828-29 in European Turkey*, and *Letters on Affairs in Turkey 1835-39*. In 1842 he married an English lady, who died in 1868, and some of his most interesting letters were written to her from Paris and elsewhere. In 1859 he became Lieutenant-General, and in 1864 his military genius was the chief cause of the defeat of Denmark, as it was of that of Austria in 1866. Moltke had long foreseen the war which broke out between France and Germany in 1870, and his was the animating spirit of the tactics throughout the war, though he had often great need of tact in causing his views to recommend themselves to the Emperor William. The fall of Metz brought Moltke honours. He was made Count and Field-marshal, and received a grant. The end of his life was passed in peaceful leisure, and the esteem in which his country held him was shown by the enthusiasm displayed upon the celebration of his 90th birthday. Moltke, though a small talker, was a great linguist. His *Essays, Speeches, and Memoirs* have been published in two volumes. (London, 1893.)

Moluccas (Dutch *Molukken*), or SPICE ISLANDS, are situate in the Malay archipelago, between Celebes and Papua, and extend from lat. 3° to 5° S. They consist of three groups—(1) Moluccas proper, containing the islands Fernate, Gilolo, Batshian, Obi, Morti, and many islets; (2) Amboyna (the seat of government), Ceram, Booroo, and several islets; (3) Banda islands. Nearly all the islands are mountainous, having peaks varying from 7,000 to 8,000 feet in height, mostly volcanic, and some of them active volcanoes; and the whole district is subject to earthquakes. There are in all several hundred islets, most of them small and uninhabited. The chief products and exports are cloves, nutmegs, sago, mace, edible birds' nests, trepang, shark's fins, some gold, and birds of paradise. The islands have been held in turn by Spain, Portugal, and Holland, and were held by England from 1796 to 1801, and from 1810 to 1814. The language spoken along the coasts is Malayan.

Molybdenum (Mo; atom. wt. 95.9), is a rare silver-white metal which occurs in a few minerals, chief of which are *molybdenite*, the sulphide MoS_2 ; *wulfenite*, lead molybdate PbMoO_4 ; and *molybdic ochre*, an oxide MoO_3 . The metal is hard and fuses with difficulty. It has a specific gravity of 8.6, and dissolves in concentrated acids. It forms many oxides and their corresponding chlorides, the formation of two chlorides of formulæ MoCl_4 and MoCl_5 being interesting. The higher oxides possess acidic properties, and in its general chemical behaviour, as would be expected from its atomic weight, it shows many resemblances to chromium.

Mombasa, an island and town off the coast of Zanzibar, east Africa, in lat. 4° 4' S. It is the headquarters of the Imperial British East Africa

Company. The island is three miles long by two wide, and the channel separating it from the mainland affords good harbours. The town is on the North Harbour, and a line is being constructed to connect the district with Lake Victoria Nyanza, and harbour works are in progress. For a long time the island belonged to Portugal, but from 1823-26 it was under British protection, the country, however, refusing to annex it. Later the Sultan of Muscat took it, and left it to his son, the Sultan of Zanzibar. In 1888 the Sultan gave government rights to the Imperial East Africa Company, and the island, together with a large mainland district, became British.

Mombuttu (*Mangbattu*), a large Negroid nation of the Upper Welle basin, south-east Sudan, whose king, Munza, when first visited by Schweinfurth in 1876, ruled over an extensive territory, with a population of at least one million. But before the Mahdist revolt the empire had already been overthrown by the Arab slave-hunters; and at present the Mombuttus appear to have been brought within the influence of the Congo Free State. They are of much lighter complexion than most Negro peoples, and also distinguished by a Jewish type of nose, somewhat full beard, and a tendency to albinism, as shown by the large percentage (one-twentieth) of persons with flaxen woolly hair. The men wear bark-cloth garments, while the women are chiefly draped in black paint, applied in bands or spots to represent zebra or leopard skins. They are a highly intelligent people, skilled workers at most crafts, and fairly civilised, although perhaps the most pronounced polygamists and cannibals in the whole of Africa (Schweinfurth, *Heart of Africa*; Junker, *Travels*, vols. ii. iii.)

Moment, in mechanics. If a force be applied to a body which either has one point in it fixed, or is attached by means of a rod to some other fixed point, that force will be unable to cause the body to move in any way, except to rotate round the fixed point. The amount of rotation which the force is capable of producing depends on the magnitude of the force, and on the perpendicular distance between the point and the direction of the force. The product of the force and the length of the perpendicular measures the rotation which the force can produce, and is termed the *moment of the force about the point*. If a line be drawn through the point perpendicular to the plane which contains the force and the point, that line will form an axis of rotation, and the above product is then called the moment of the force about this axis. It is convenient to regard moments as positive or negative, according as the rotation is clockwise—*i.e.* in the direction in which the hands of a clock move—or contra-clockwise. The moment of a couple (q.v.) is the same for all points in space, and is equal to the product of one force and the perpendicular distance between the two. The *moment of inertia* of a body about an axis is the sum of the products obtained by multiplying the mass of each particle of the body by the square of its distance from the axis. This summation, as a rule, can only be done by the aid of the integral calculus.

Moment, MAGNETIC. The magnetic moment of a magnet is the product obtained by multiplying the strength of the pole of the magnet by its length, and is one of the factors in the moment of the couple which tends to turn a deflected magnet into the magnetic meridian.

Momentum, or, as it was called by Newton, the "quantity of motion" of a moving body, is the product of the mass of the body and its velocity. A force acting on a body for a certain time produces in that body a definite amount of momentum; and experiment has shown that the momentum is equal to the product of the force and the time during which it acts. When any body acts on a second, the latter reacts on the former, and the action and reaction are equal and opposite, as stated in Newton's third law of motion. The momentum produced by the action must therefore be equal to that produced by the reaction; this is equivalent to saying that there is no loss of momentum when two bodies act on each other. Applying this to any system of bodies mutually acting on each other, we see the momentum of the system remains constant. This fact is known as the conservation of momentum.

Momfu, a very large Negro nation, whose domain lies in the unexplored region between the rivers flowing north to the Welle and south to the Middle Congo either through the Aruwimi or in independent channels. The Momfu have not yet been visited by any explorers, and little is known of them beyond the meagre information obtained from neighbouring peoples by Dr. Junker during his wanderings in the Welle basin. (*Travels*, vol. iii.)

MommSEN, THEODOR, German scholar and historian, was born in 1817 in Schleswig, and studied at Kiel. He then went to France and Italy to make a special study of Roman inscriptions, being sent for that purpose by the Academy of Berlin. After his return he edited a newspaper for a time, and was in 1848 appointed to a chair of jurisprudence at Leipzig, a position which he lost by reason of his politics. From 1852-58 he professed Roman law successively at Zurich and Breslau, and in 1858 was appointed professor of ancient history at Berlin, and here he edited *Corpus Inscriptionum Latinarum* for the Berlin Academy. But the work by which he is best known in England is his *History of Rome*, published in three volumes (1854-56), with an additional volume in 1885 giving the history of the Roman provinces from Cæsar to Diocletian. This work, which has been translated into English, is a monument of scholarship and almost universal learning, though the political views taken in it have been called in question. Many other works he has published on Roman law, coins, inscriptions, history, etc. The esteem in which he was held by English students was shown upon the occasion of the burning of his library in 1880, when English students subscribed to make good in so far as possible his loss. His two brothers, TYCHO and AUGUST, have also made themselves names, the former as classical scholar, the latter in the region of Greek and Roman chronology.

Mon (MONG, MANGAR), a widespread people of Indo-China and north-east India, and found also in scattered groups in Yunnan, the Tonking highlands, and the Vindhya Mountains of Central India. All are rude, wild tribes except the Mons of Pegu, Lower Burma, whom the Burmese call Talaings, and who were civilised by the introduction of Buddhism in the 5th century of the new era. These were formerly the ruling people throughout the whole region watered by the Lower Irawady, Sitang, and Salwen rivers, but were reduced about the middle of the 18th century by the Burmese. Their language resembles that of the Mundas and other Kolarians of Central India, and all the Mon tribes are now regarded as originally of Kolarian stock. Most of the Mons of Lower Burma now speak Burmese, but their settlements may still be recognised in Pegu by the cocoanuts and red or yellow bannerets attached to the gables of the houses, in honour of the *Shway Yoe*, or "Protecting Spirit."

Monachism, the principle of leading a life of seclusion in religious houses in the manner of monks (*monachi*) and nuns. Properly the life is solitary, each member of the religious community occupying a separate cell and keeping silence at meals. Monachism, or the corporate life of collections of solitaries, was first instituted among Christians in the 4th century in Upper Egypt, but amongst Buddhists before the Christian era.

Monaco, a small European principality lying between the French Alpes-Maritimes and the Mediterranean, and formerly containing 53 square miles, but now much contracted, as in 1861 the reigning prince sold Mentone and Roccabruna to France for £160,000. So the principality now consists only of the towns of Monaco and Monte Carlo, with a surrounding district of eight square miles. Monaco, the capital, is on a peninsula, and is a celebrated watering-place, prettily situated amid olive, orange, and lemon groves. The exports are olive-oil, lemons, oranges, perfumes, liqueurs, and pottery. There is an army of 126 men. The Emperor Otho I. in the 10th century gave Monaco to the Grimaldi family, and a descendant of this family still reigns.

Monactinellidæ, the group of sponges including those forms in which the spicules (q.v.) consist of simple unbranched rods.

Monaghan, a county of Ulster, Ireland, having on the N. Tyrone, on the E. Armagh and Louth, on the W. Fermanagh, and on the S. Cavan and Meath. The extent is 319,741 acres, the greater part being arable, and it is 30 miles long by 20 broad. The surface is for the most part hilly, and is mountainous in the N.W., and there are many bogs and small lakes. The chief rivers are the Blackwater, Annalee, Finn, and Lagan, but these are not navigable. The chief crops are oats, potatoes, and much flax, but wheat is not grown. Spade-husbandry is a feature of the county. The linen manufactories employ very many of the population. The county is divided in five baronies, and returns two members to Parliament. The principal towns are Monaghan (the capital), Castleblaney, Clones, Carrickmacross, and Ballybay.

Monastery, an establishment in which monks live; the term is extended so as to include abbey, nunnery, priory, friary, and *laura*. In the Middle Ages monasteries fulfilled the functions of schools and colleges, hotels, workhouses and systems of poor relief, and missions. They were places of refuge, and in them the germs of dormant civilisation were preserved and developed. They used to be called *minsters* in England, as their churches are still called—*e.g.* York Minster.

Monastir, or BITOLIA, a town of Macedonia, in European Turkey, 400 miles W. of Constantinople, situate on the edge of a plain between two mountains and traversed by a river crossed by several bridges. The town is well built and has wide streets and handsome bazaars, while abundance of cypress and willow give it a pleasant appearance. It is an active military centre, and there are many Turkish soldiers and officials, the remaining majority of the inhabitants being Greeks and Bulgarians. There is a considerable trade with Constantinople, Salonica, Vienna, and Trieste.

Monboddo, LORD (JAMES BURNETT), (1714-99), a Scottish lawyer, was born at the family seat of Monboddo, in Kincardineshire. He was educated at Aberdeen and Gröningen, and, after practising at the bar, was raised to the bench of the Court of Session in 1767. He was much given to philosophical studies, but was eccentric and whimsical in views and manners. His principal works are *Origin and Progress of Language* (3 vols.), *Ancient Metaphysics* (3 vols.). He believed, or professed to believe, in satyrs, mermaids, and the like, and is noted for his theory of the close relationship that exists between man and the monkey.

Moneywort, a popular name applied to several plants, especially to *Lysimachia nummularia* and to *Anagallis tenella*, both indigenous members of the order Primulaceæ. The former, also known as Creeping Jenny and as Herb Twopence, is a trailing plant, with roundish glossy leaves and golden funnel-shaped flowers. The latter, generally known as the Bog Pimpernel, is much smaller, and has rounded leaves and small pink flowers. The name *Cornish Moneywort* is applied to *Sibthorpia Europæa*, also a trailing plant with rounded leaves, but belonging to the Scrophulariaceæ.

Monge, GASPARD (1746-1818), French mathematician and natural philosopher, was born at Beaune, and educated at Beaune and Lyons. He taught in the military school at Mezières, and, coming to Paris in 1780, lectured there upon hydrodynamics. In 1792 he became Minister of Marine and member of the executive, in which capacity he signed the warrant for Louis XVI.'s execution. Resigning his official position, he occupied himself with military improvements, and had a great share in founding the École Polytechnique. In 1795 he was sent to Italy to select art treasures for transport to Paris. In 1798 he accompanied Napoleon, with whom he was in favour, to Egypt; but, on Napoleon's downfall in 1815, he was expelled from the Institute and lost his appointments. Among

his many works are a *Treatise on Statics, Géométrie Descriptive, L'Art de fabriquer les Canons*.

Mongolo-Tatar, RACES AND LANGUAGES.
[URAL-ALTAIC.]

Mongols (MONGOLIANS), a main division of Mongolo-Tatar race [URAL-ALTAIC], who take their name either from the word *mong*, i.e. "brave," "daring," or else from the small *Mongol* tribe of which Jenghis-Khan was chief, and which in the 12th century was seated near the Kara-Kara mountains north of the Gobi Desert. The Mongols, taken as typical members of the family, are characterised by a distinctly yellowish complexion, somewhat of the same shade as the yellow of the Negro palm; long, lank, jet-black hair, cylindrical in section; beardless face; small, black, and oblique eyes; high cheek-bones; short, flat nose; moderately prognathous lower jaw; broad, flat features; short thick neck; squat, robust figures, rather below the mean height; generally of coarse build, and of ungainly appearance on foot, but more comely in the saddle, in which most of their existence is passed. Temperament sluggish, somewhat sullen or taciturn, passive, with little initiative and dull imagination, but with great staying power, and subject at times to sudden impulse and vehement outbursts; hence, although incapable of founding stable empires, they have more than once overrun the northern hemisphere from the China seas nearly to the Atlantic, and have imposed several dynasties on the Chinese; but since the 17th century they have been entirely subject to the Middle Kingdom, and during this period the whole nation appears to have been steadily declining. Observers speak of them as a dejected and even cowardly people, unmindful of the past, heedless of the future, almost indifferent to the present. At least, they show no capacity for social progress, persisting in their dirty, slovenly habits, clinging to their tents and herds (for all are still nomad pastors), and even passively allowing the Chinese peasants to overflow into their domain and gradually bring under cultivation all the best grazing grounds, and threatening them with absolute extinction in the near future. Unlike their Mohammedan Tatar kindred, the Mongols have been Buddhists since the 13th century, though preserving many traces of their primitive Shamanistic religion. The "Red Cap" sect was first introduced under Kublai-Khan; but it made little progress, and was completely supplanted in 1566 under Altin-Khan by the "Yellow Cap" sect, which, being more suited to the national character, spread rapidly, and is now the exclusive religion of all peoples of Mongol speech. The language, spoken with little dialectic variety by all branches of the nation, is a typical agglutinating form of speech intermediate between the eastern Manchu, and the western Turki; cultivated since the 13th century, when it was reduced to written form with a peculiar alphabet adopted from the Syro-Uighur by the Lama Sakia Pandita, and perfected by Tsorji Osir under Jenezek-Khan (1307-11). The letters are written in vertical lines and read from left to right; but the literature consists mainly of translations from Tibetan and

Chinese Buddhist writings with a few national chronicles, legends, and songs. The chief branches of the Mongols proper are the Khalkas, Sunni, Chakars, Urutes, Ordos, and Eleuths, in and about the east Gobi, the Kalmuks in the west, and the Buryats of the Lake Baikal region, Siberia. Those subject to China form 41 *aimaks* (principalities) and 226 *koshungs* ("banners"), under hereditary khans, numbering altogether from 3,000,000 to 4,000,000; but, including all branches, and the Persian-speaking Mongols of Afghanistan (Hazarahs and Aimaks), all the peoples of Mongol stock scattered over Asia and Europe (Lower Volga), are estimated at about 5,000,000. (Pallas, Klaproth; Schott; Ney Elias; Prejevalsky, *Mongolia*, 1876; H. H. Howorth, *History of the Mongols*, 1876-82.)

Mongoose. [ICHNEUMON.]

Monitor, an old synonym of *Varanus*, the type-genus of *Varanidae* (Water-Lizards), chiefly from the Oriental region, and used also for any individual of the family. They are the largest living lizards; the tail is generally compressed laterally to serve as a swimming organ, and the protrusible tongue ends in two filaments. The Nile Monitor (*V. niloticus*), from five feet to six feet long, is olive-grey marked with black. The name is due to the belief that these reptiles give warning of the approach of a crocodile by a hiss or whistle. The young of the Indian species is erroneously supposed to be venomous. [HELODERM.]

Monk (properly MONCK), GEORGE, DUKE OF ALBEMARLE, was born in 1608, and, having first taken part in Lord Wimbledon's expedition to Cadiz in 1625, entered the army as a volunteer, and served with the expedition to the isle of Rhé in 1628. For some years afterwards he acted in a military capacity under the Earl of Oxford in Germany and Holland, and in 1639 fought in the war in Scotland. At the outbreak of the Rebellion he hesitated as to the side on which to range himself, but at last declared for the king. At the battle of Nantwich he was taken prisoner, and, being sent to the Tower, was not liberated until 1646, when he was given command of the English forces in Ulster. There, on account of the lack of support from the Parliament, he was unsuccessful; but Cromwell had already recognised his ability, and in 1650 made him lieutenant-general of artillery in the army in Scotland. Monk greatly distinguished himself at Dunbar, and was then left to complete the Scottish campaign. In 1652 he was appointed one of the Admirals and Generals of the Fleet, and as such commanded the white squadron at the battle of Portland in 1653. After the Dutch war he returned to his command in Scotland, where he remained until the death of Cromwell. He recognised Richard Cromwell, and was prepared to support him; but, finding that the weakness of the new Protector was leading to disorder and anarchy, Monk crossed the Border on January 1st, and entered London and invited Charles II. to return to England. On the arrival of the king Monk was created Duke of Albemarle and lieutenant-general of the

forces, and was given a perpetual pension of £7,000 a year. When a new Dutch war broke out in 1665 he was appointed joint admiral with Prince Rupert. He died in January, 1670.

Monkey. In popular language a monkey is a Primate with a tail, the term "ape" being used for tailless forms. [BABOON.] How little the tail may be relied on as a character for classification of any kind may be seen from the fact that in some macaques it is long, in others short, in one tufted at the end, and in another absent altogether. The Primates consist of two sub-orders: (1) Anthropoidea, (2) Lemuroidea. [LEMUR.] In the Anthropoidea are five families: (1) Hominidæ (Man), (2) Simiidæ (Anthropoid Apes), (3) Cebidæ (New World Monkeys), (4) Cercopithecidæ (Old World Monkeys), and (5) Hapalidæ (Marmosets). To individuals of the third and fourth families the term "monkey" is properly applied; and some authorities include the fifth family in a group with the third (Platyrrhini), the Old World Monkeys being placed in a second group (Catarrhini). These two groups are separated not only in geographical distribution, but also by anatomical characters. The nose is flat, the nostrils far apart; all are arboreal, and the tail is generally prehensile. The thumb is not opposable, and the digits bear nails instead of claws. Here belong the Howlers, Spider Monkeys, Capuchins, etc. In the Catarrhini the nostrils are near together; the tail is never prehensile, and the thumb, when present, is opposable. To this group belong the baboons, entellus, Diana monkey, macaques, etc. Only one monkey is European. [BARBARY APE.]

Monk Fish, the Angel-fish (q.v.). The name was formerly applied to a gigantic squid.

Monkswell, ROBERT PARRETT, LORD (b. 1817). was educated at Cambridge and called to the bar in 1843. He became Solicitor-General in 1863, and later Attorney-General, a post which he again assumed in 1868. In 1871 he was appointed to the Judicial Committee of the Privy Council and in 1885 was raised to the peerage. He died in 1886.

Monmouth, parliamentary borough (returning with Newport and Usk district one member), municipal borough, and market-town, and capital of Monmouthshire, is situated in a pretty valley near the junction of the Monnow (crossed by an ancient bridge), and the Wye (crossed by a modern stone bridge); 18 miles S. of Hereford, and 27 S.W. of Gloucester. It consists of one large street, running through an old gateway from Monnow bridge to the market-place, and several divergent streets. The principal buildings are the parish church, with a fine spire of over 200 feet, the grammar school, a modern town-hall, and the market-house; and there are some remains of the castle in which John of Gaunt lived and Henry V. was born. The principal manufactures are iron, tin-plate, and paper, and there is a considerable trade in these products.

Monmouth, JAMES, DUKE OF (1649-85), the son of Lucy Walters and (as is supposed) Charles II., was born at Rotterdam and educated in France at the charge of the king. After the Restoration he was called to England, and was made

K.G.. Earl of Orkney and Duke of Monmouth. At sixteen he married Anne, daughter of the Duke of Buccleuch, and he became popular in the country in proportion as the Duke of York was disliked and hated. He is described by Hume as brave, affable, thoughtlessly generous, and graceful in person; but his nature was weak, and he would not have been politically dangerous but for the influence and talent of his adviser, Shaftesbury. In 1679 he commanded at Bothwell Brigg, but was deprived of his command and sent from the kingdom to please the Duke of York. On being allowed to return to England he plotted with Shaftesbury and others; but the plot was discovered in 1683, and Monmouth, after being in hiding for a time, was pardoned on promising amendment. He afterwards denied having made promises, and was again sent abroad. On the accession of James II. he embarked on his romantic but foolhardy expedition to invade England, an attempt which cost him his life, and brought much disaster on the west of England. In June, 1685, he landed at Lyme with 100 followers, and assumed the title of James II. and the next month found him, after the battle of Sedgemoor, starving in a ditch, where he was hiding disguised as a peasant. After vainly suing to his uncle for life, he died on the scaffold.

Monmouthshire, a maritime county of England, having Hereford and Brecknock on the N., Glamorgan on the W., Gloucester on the E., and the Severn estuary on the S. and S.E., and containing over 370,000 acres, most of which is arable, meadow, or pasture land. The surface is varied, being in parts mountainous and rocky, and in others consisting of fruitful slopes and plains, woods, pastures, and well-cultivated land. The Usk, with its tributary the Ebbw, flows through the county, and the Wye and Monnow are on the boundaries. The geological formation W. of the Usk belongs to the South Wales coal-fields, and is bordered by carboniferous limestone, while E. of the Usk lies the old red sandstone. The chief products are iron, coal, limestone, and other stone, the two first being of highest importance, since there are over a hundred collieries, and numerous blast-furnaces, puddling-furnaces, steel and tin-plate works, and rolling mills. A good deal of flannel and coarse cloth is manufactured. The chief headquarters of the coal and iron manufacture are Pontypool, Blaenavon, Tredegar, Rhymney, and Ebbw Vale. The chief towns are Monmouth (capital), Newport (at the mouth of the Usk), Abergavenny, Blaenavon and Tredegar. Monmouthshire was made an English county by Henry VIII. The ruins of Tintern and Llanthony Abbeys are in this county.

Monochlamydeous (from the Greek *monos*, one, *chlamys*, a cloak), is a term applied to flowers in which the perianth is represented by a single whorl of floral leaves. This whorl is generally green, or *sepaloid*, as in the nettles; but sometimes *petaloid*, as in mezereon. Such flowers occur mostly among the Incompletæ (q.v.); but not exclusively, many Ranunculaceæ, such as *Clematis*, *Anemone*, and *Caltha*, being monochlamydeous, though belonging to a dichlamydeous (q.v.) group.



MONKEYS.

Monochord, or SONOMETER, is an apparatus by which the vibrations of strings may be observed. A single string or wire is stretched over two pieces of wood fixed to a sounding-board. One end of the string is fixed, the other passes over a pulley and is loaded with weights. The length of the vibrating string is altered by placing a movable bridge between the two fixed ones, only that part of the string between the movable bridge and the bridge nearest to the pulley being considered. The number of vibrations of the wire per second is found to increase with the load applied, and to decrease when a greater length is used.

Monocotyledons, the smaller and, in some respects, less highly organised of the two classes of angiospermous flowering plants. In their embryos they have only one cotyledon, which generally remains within the seed (hypogeal). The radicle does not usually, except in palms (q.v.), develop into a tap-root, often not even leaving the seed but being replaced by a tuft of adventitious, unbranched root-fibres. Bulbs, corms, and seldom-branched cylindric stems [CAUDEX] are common in this class. There are in the stem numerous *closed* fibro-vascular bundles, *i.e.* strands of wood and bast (xylem and phloem), with no fascicular *cambium* (q.v.) or growing tissue between them, and, therefore, incapable of increase in diameter. The stems of a few arborescent forms are capable of indefinite increase in diameter, retaining a *pericycle*, or zone of merismatic fundamental tissue in which new bundles originate. This is the case in *Dracæna* and *Aloë*. There is neither distinct pith nor separable bark to the stem. The leaves are commonly simple, though often very large and sometimes tearing into leaflets, as in many palms. They are without stipules, often sheathing at the base, with a glossy smooth surface, entire or distantly toothed margin, and parallel main veins. Much finer cross veins often divide the leaf into a regular network. The parts of the flower (q.v.) are generally in whorls of three, the typical floral diagram of the whole class being 3.3.3 + 3.(3). The seeds are generally albuminous. Some fossils apparently referable to Monocotyledons occur in Jurassic rocks; but the class is well represented for the first time in the Eocene. It is subdivided into two subclasses, *Petaloidæ* and *Nudifloræ*, mainly by the characters of the perianth, which is petaloid in the one and reduced or absent in the other. The former is divided into the two series *Hypogynæ* and *Epigynæ*, according as the ovary is superior or inferior; and the latter into the *Spadicifloræ*, which have a spadix (q.v.) or fleshy peduncle, and the *Glumifloræ*, in which the flowers are enclosed by rigid chaff-like bracts or glumes (q.v.). Among the chief orders of Monocotyledons are the Liliaceæ, Juncaceæ, Amaryllidaceæ, Iridaceæ, Orchidaceæ, Palmaceæ, Aroideæ, Cyperaceæ, and Gramineæ, many of which are separately described.

Monœcious (from the Greek *oikos*, "a house") is the term applied to plants in which the sexes, though in separate flowers or on distinct branches, are on the same individual. Some mosses (q.v.),

bearing both antheridia and archegonia, and similarly the prothallia of some ferns (*see* Fig., vol. iv. p. 277), are termed monœcious. Among flowering plants monœcism is the rule among Gymnosperms and is common among the reduced types of Angiosperms. It is the rule among the spadicifloral Monocotyledons, and, though rarely occurring among grasses (maize being an example), is common among sedges. Among Dicotyledons, some of the nettle tribe (Urticaceæ), the hazel (Corylaceæ), oak (Quercineæ), Begonia, and most of the spurge tribes (Euphorbiaceæ), furnish examples of monœcious flowers.

Monogram, a single design, consisting of a letter or of letters interlaced or combined, especially a design formed by a person's initials. One of the most famous monograms is the interlaced X P of the labarum (q.v.).

Monolith. [STANDING STONES.]

Monomania. [INSANITY.]

Monopetalous, an inaccurate term applied to Gamopetalæ (q.v.), implying that a flower has but one petal, whereas in reality there are several, though they may happen to be united below by a corolla-tube.

Monophysites. [COPTS.]

Monopoly, the exclusive privilege of trading in or manufacturing a certain commodity, exercised by a government itself, or granted to a person or to persons; also the entire control of the trade in a commodity no matter how acquired. Most governments claim and exercise the monopoly of coining money.

Monotremes (MONOTREMATA), the single order of the sub-class Prototheria (*Ornithodelphia* of De Blainville). The animals of this order—the lowest of the Mammalia, are restricted to the Australian region, and resemble the Sauropsida (Birds and Reptiles) in having a cloaca or common passage into which the urinary, genital, and food canals open, whence the name Monotremata. De Blainville's name refers to the resemblance between the female reproductive organs and those of birds. There are but two families: Ornithorhynchidæ and Echidnidæ. [ORNITHORHYNCHUS, ECHIDNA.] These animals are oviparous, and the mammary glands, which are of a different type from those of higher Mammals, open by a mere slit on each side of the abdomen. The eggs resemble those of birds in that part of the yolk nourishes the embryo.

Monro, ALEXANDER (1697-1767), a Scottish anatomist, and founder of the Edinburgh Medical School, was born in London, and studied at Edinburgh, and in London under Cheselden, going afterwards to Paris and to Leyden, where he was a pupil of Boerhaave. In 1719 he began to lecture on anatomy and surgery at Edinburgh, and in 1720 became professor of these subjects at the university. His chief works are *Anatomy of Human Bones and Nerves*, and *Essay on Comparative Anatomy*. ALEXANDER, his son (1733-1817), succeeded to his father's chair in 1759, and was also a distinguished anatomist. He wrote on *The Nervous System*, and the *Structure and Physiology of Fishes*.

Monroe, JAMES (1758-1831), President of the United States of America, was born and educated in Virginia. He served with distinction in the Revolutionary War, adopted the practice of the law, and in 1782 became a member of the Virginia Assembly and of the Executive Council. He was member of Congress from 1783 to 1786. In 1788 he was a member of the convention for settling the Constitution of the United States, and was opposed to the extension of federal power. In 1790 he was elected to the Senate, and from 1794-96 was minister-plenipotentiary to Paris. After being Governor of Virginia in 1799, he went in 1803 as minister-extraordinary to Paris, and was instrumental in bringing about the acquisition of Louisiana. In 1811 he was Secretary of State and for War, and in 1816 was elected President, being re-elected almost unanimously in 1820. He seems to have owed his great popularity to having, in his first term of office, acquired Florida from Spain, and settled the slave boundary. The *Monroe Doctrine* (so called from his Presidential message of 1823) was substantially that the United States disapproved of any European interference in aid of Spain against her revolted South American colonies, or to any further foundation of European colonies in America. Popularly it means that the United States is a sort of guardian of the independence of the other states of America. But though perhaps implied in the recent relations of that Power and the South American states, it has never been formally acted on by the United States Government.

Mons, a Belgian town, capital of Hainault, on the river Trouille (crossed by four bridges) 27 miles S.E. of Tournai. It was once strongly-fortified, but its fortifications, like those of other Belgian towns, have been demolished, and their place is occupied by boulevards. The chief buildings are the fine churches of St. Wandru and St. Elizabeth, and the Gothic 15th-century town-hall, and there are hospitals, arsenal, court-house, school of arts, theatre, academy of music, and many educational establishments. The chief industries are the manufacture of linens, woollens, cotton, muslin, cutlery and fire-arms, and brewing and bleaching are carried on. A canal connects the town with the Scheldt, a great convenience for the trade in coal, stone, marble, horses, cattle, and corn. Mons is in the Belgian coal district, and from two to three millions of tons are annually raised in the neighbourhood, and much of this passes through the town.

Monson, SIR WILLIAM, British naval officer, was born in Lincolnshire in 1569, and, having gone to sea at the age of 16, distinguished himself almost immediately in an action with a large Spanish privateer. At the age of 18 he had a ship of his own, and in 1588 he served against the Armada. In 1596 he was flag captain to the Earl of Essex at the attack upon Cadiz, and was knighted. In 1602 he served as vice-admiral, and had the good fortune to capture a treasure-ship worth a million pieces of eight. Thenceforward he frequently went afloat as a flag officer, and was for twelve successive years in command of the Narrow Seas, in which he almost entirely put down piracy. But, in spite

of his deserts, he incurred unpopularity with the Administration because he exposed naval abuses, and with the people because, in pursuance of orders, he prevented the escape of Lady Arabella Stuart; and in 1616 excuse was found for his committal to the Tower. Yet, as nothing in the shape of a serious charge was brought against him, he was presently liberated, and speedily regained his old position of trust and influence; and as late as 1635 held active command. In his subsequent retirement he wrote his most valuable *Naval Tracts*, which throw a great flood of light upon the navies of Elizabeth, James, and Charles, and which entitle him to be regarded as the father of all our naval historians, antiquaries, and commentators. Sir William died at Kynnersley, Surrey, in 1642.

Monsoon, name of the trade winds which blow in the Indian Ocean and the adjacent lands. From April to October a strong south-west wind with rain prevails; from October to April a gentle dry north-east breeze. The change or breaking up of the monsoons is attended by violent storms.

Monstrosity. Any anomalous development of the embryo produces what is termed malformation, and when such deviation from the normal is extreme the term monstrosity is employed. Single and double monsters are described; in the case of the former the malformation affects a single individual, in the latter two embryos have certain parts in common.

Montagnais, a term applied by the Franco-Canadians to two distinct North American peoples: (1) A Hudson Bay tribe, who are a branch of the Athabaskan family, and whose proper name is *Déné* ("Men"); they roam a vast region of some 200,000 square miles between the Churchill river and the Great Slave Lake, but number at present (1892) not more than 5,000, mostly in the service of the Hudson Bay Company. (2) A Canadian tribe, who are a branch of the Algonquian family, and who represent the Tadussians, Shicoutimians, Pikwagamians, the Great and Little Mistassins and others mentioned by the early French writers. They occupied a territory of about 120,000 square miles in the Saguenay basin and the interior of Labrador, and since the time of Champlain were always steadfast allies of the French in their wars with the Iroquois. At present they are reduced to about 1,920, chiefly in the Betsiamits district, and grouped round the Catholic mission of the Pointe-Bleue Reserve on the west side of Lake St. John.

Montagu, SIR GEORGE, British admiral, was born in 1750, entered the navy in 1763, and became a captain in 1773. He assisted at Rodney's relief of Gibraltar, and in the capture of the Caraccas convoy. He was made a rear-admiral in 1794. From 1803 to 1809 he was commander-in-chief at Portsmouth, and, during that important period, by his energy and resource contributed greatly to keeping the fleets in serviceable condition. He died an Admiral of the Red in 1829.

Montagu, LADY MARY WORTLEY (1690-1762), daughter of Evelyn, Duke of Kingston, and Lady Mary Fielding, daughter of the Duke of Denbigh,

was born at Thoresby, in Nottinghamshire. She was a child of great promise, and learned Greek, Latin, and French with her brothers. At twenty she translated part of Epictetus's works, and at twenty-two she married, living for a time with her husband at Wharnccliffe, till on his becoming a minister she accompanied him to London, where she made the acquaintance of Addison, Congreve, Pope, and other men of mark. In 1716 Mr. Montagu was appointed ambassador to the Porte, and she accompanied him to Turkey, whence she wrote her well-known *Letters*. While here she adopted the Turkish practice of inoculation for the small-pox, and endeavoured to introduce it into England. In 1718 she returned to England, and, at Pope's request, took up her abode at Twickenham, where the poet and she were fast friends for a time, but then quarrelled and became as keen enemies. From 1739-61 she lived on the Continent, mostly at Venice, but at her husband's death she returned, and herself died the next year. She wrote poems of some merit, but her great point was correspondence, in which she ranks second only to Madame Sévigné among female letter-writers. Her *Correspondence*, *Poems*, *Essays*, with *Life* (6 vols.), were published in 1803, and there have been several later editions.

Montague, CHARLES, EARL OF HALIFAX (1661-1715), born at Horton in Northamptonshire, grandson of Henry Montague, 1st Earl of Manchester, was educated at Westminster school and Trinity College, Cambridge. He wrote a poem on the death of Charles II., and in 1687, with Prior, *The Town and Country Mouse*. He was one of the promoters of the Revolution, and in 1692 became a Lord of the Treasury. In 1694 he became Chancellor of the Exchequer, and next year carried out a system of recoinage, making Newton Master of the Mint. In 1696 he introduced exchequer bills, and then inaugurated our National Debt and assisted in the establishment of the Bank of England. In 1700 he became Lord Halifax. During Queen Anne's reign he was twice impeached by the Tories, and held no office, but was an active advocate of the union with Scotland. George I. conferred on him an earldom and the Order of the Garter. For about six months before his death he was First Lord of the Treasury. He was a poet, but is best known as a financier, a Whig magnate, and the patron of Addison.

Montaigne, MICHEL EYQUEM DE (1533-92), French man of letters, was born at Périgord, of a family of high descent. His father put him under the care of a German tutor, who could not speak French, but had to communicate with his pupil in Latin, the result being, as the father wished, that the boy grew up without learning French, and had to learn it as a foreign tongue. He learnt Greek in the ordinary way, though in this case, too, the father had wished to employ an exceptional method. As to moral training, the father put little restriction upon him, but endeavoured to make him refer everything to a standard of right and wrong. Later he was sent to the college of Bordeaux, and after that studied law for a time; but this did not suit him, and he found the contemplation of human

nature the only pursuit that interested him. He travelled in Germany, Switzerland and Italy, and in 1581 was made a citizen of Rome. In 1582 he was mayor of Bordeaux, but was soon glad to escape to his castle and philosophy. During the Huguenot trouble he was so unfortunate as to displease both sides, and to suffer at their hands, while in 1586 the plague drove him away from his home. After, however, a stay in Paris he returned home for the latter part of his life. Although from the circumstances under which he learnt French Montaigne never attained the highest purity of style, he has a style of his own, bold and original. He had strong views upon educational questions, but his general attitude as to life and morals was a tentative one; *Que sais-je*, was his motto. Of his celebrated *Essais* there are two English translations, and biographies of him have been written both in English and in French. His *Voyages* (partly written in Italian) were published 200 years after his death.

Montalembert, CHARLES FORBES, COMTE DE (1810-70), French politician, historian, and theologian, was by his mother's side of the Scottish family of Forbes, hence his knowledge of English, and his fondness of the English social system. He was a curious mixture of ardent liberal with aristocratic instincts, and Ultramontane Catholic. Along with his comrade Lacordaire, and the Abbé Lamennais, he indulged in dreams of a democratic theocracy, an alliance between Catholicism and liberty, and in 1830 he started a paper, *L'Avenir*, taking as its motto "God and Liberty." In 1831 Lacordaire and Montalembert together started a public school without permission of the Government, the result being a prosecution, and a brilliant speech in defence by Montalembert, their only punishment being a fine of 100 francs. In 1832 the Pope condemned *L'Avenir*, and Montalembert abandoned some of his liberal ideas, and gave himself more fully to Ultramontanism. About 1836 he became a member of the Chamber of Peers, and distinguished himself as a defender of the freedom of the press. In 1843 he went to Madeira, where he studied the history of St. Bernard. At this time he was known as an eloquent orator, a defender of the episcopate, and an acknowledged chief of the Catholic party. He was a strong advocate of the freedom of Poland, of the Greeks, of the Syrian Christians, and of Ireland. For the sake of the clerical party he joined the party of reaction after 1848, but he defended Louis Napoleon against unjust accusations. In 1852 he became an Academician, and in 1857 he retired from public life. The chief work of his later years was contributing to *Le Correspondant*, in whose columns he vigorously attacked M. Veuillot. In 1869 he was opposed to the dogma of infallibility, and a few days before his death wrote a striking letter as to the power of the Vatican. His works (of which *Les Moines de l'Occident* is perhaps the best known) have been published in 9 vols. An interesting little piece of his is *La Grammaire et le Dictionnaire*, a discourse on the study of language.

Montana, one of the United States of America, was formed into a territory in 1864 out of Idaho

and Dakota, and became a state in 1889. It has the British possessions on the N., and contains 146,000 square miles. Besides the white population, there are over 10,000 Indians on the reservations. It is generally mountainous, and is crossed by the Rocky Mountains. Its rivers are the Missouri, the Yellowstone, and a branch of the Columbia. The eastern part is a dry, sterile plateau, but the river valleys of the west are very fertile. Owing to the scanty rainfall, irrigation is necessary for agriculture, which is increasing, and the good grazing grounds support quantities of wild stock. Montana is very rich in gold and silver, and produces also lead, copper, iron, and coal. Among its animals are the grizzly bear, Rocky Mountain sheep, moose, and antelope; and there are fine forests of pine, fir, and cedar. The North Pacific Railway runs through the state from E. to W. The capital is Helena.

Montanism, the tenets of a very ascetic sect founded by Montanus of Phrygia in the second century, who believed in the inspiration of their founder, in the continuance of miraculous gifts, and in the near approach of the Millennium with the New Jerusalem at Peruza in Phrygia. They became extinct in the 4th century, except a Gaulish remnant which lasted into the 5th century.

Montauban (MONS ALBANUS), a French town, capital of the department Tarn and Garonne, on the Tarn, and 342 miles south-west of Paris. It is on a table-land surrounded by the Tarn and the Tescon. It is well built, and contains a cathedral, a bishop's palace, and a town-hall. It was formerly a stronghold of the Huguenots, having been besieged in 1580 and 1621, and finally taken by Richelieu in 1629, when its walls were demolished. There is still a Protestant academy and theological college. The chief productions are silk cloths, cloths, colours, porcelain, starch, and candles, and there are spinning-mills, dye-works, and potteries.

Mont Blanc, the highest (excluding the Caucasus) mountain height of Europe (15,781 feet), is in the Pennine Alps on the frontiers of France, Italy, and Switzerland. The summit and most of the chain, which has a S.W. and N.E. direction, are in the Haute-Savoie. The N.E. part of the chain is in Switzerland, and the boundary-line of France and Italy runs along it. The S.E. presents a precipitous face, but from the N. or S. its shape is pyramidal. The chief glaciers which it contains are on the N.W. slope, among them being the Des Bossons, du Bois, du Taléfre, and the Mer de Glace. The rock composing the central mass is protogine. Jacques Balmat was the first to ascend the mountain (in 1786), since which period it has been climbed times without number.

Montcalm, LOUIS JOSEPH, MARQUIS DE (1712-59), a French general, was born near Nîmes. He entered the army at fifteen, and in 1746 was wounded and made prisoner at Piacenza. Ten years afterwards he was appointed to the command of the French troops in Canada, and in this capacity he captured Oswego from the British. In 1757 he crossed Lake George, and with a mixed

army of his own men and Indian allies he took Fort Henry, allowing the garrison free exit with the honours of war. The massacre of the garrison which followed, at the hands of the Indians, whom he could not control, has been graphically described by Fenimore Cooper. In 1758 Montcalm successfully defended Ticonderoga against General Abercrombie, and after different losses he finally defended Quebec until its surprise by General Wolfe. In the battle which followed upon the Heights of Abraham he, like Wolfe, was mortally wounded, and died next day.

Mont Cenis is a pass in the Graian Alps, and lies between Savoy and Piedmont. The road was constructed by Napoleon I., and at the top is a plain containing a hospice, and a lake which abounds in large trout. The noted tunnel of Mont Cenis, which unites France and Italy, is really 15 miles to the south-west of Mont Cenis, and passes under the Col de Fréjus. The construction of this tunnel, nearly eight miles long, was a splendid engineering feat, and required fourteen years for its completion (1857-71).

Monte Carlo, in the principality of Monaco, is both famous and infamous for its gambling establishment, which is a fashionable resort for players from the whole civilised world, and supplies most of the revenues of the state.

Monte di Pietà, "fund of piety," a pawnbroker's establishment instituted and maintained by public authority. The first establishment was started in 1496 at Florence.

Montefiks, the most numerous and powerful of all the Mesopotamian Arabs, whose territory comprises a great part of the province of Baghdad along the banks of the Lower Euphrates between Korna and Samavat; two main sections, Ajwâd and Beni Malek, whose genealogies show direct descent from the old Zaltân tribe of Lower Chaldæa, and who after fusion of the two took the name of *Montefik*, i.e. "United." The chief family claims descent from Maneh, an old Sherif of Mecca. Originally nomads, most are now settled, their chief stations being Nazrieh and Suk-esh-Sheyokh. Even the Beni-Malek, who still live in tents, have also fixed residences in the tribal villages. The Montefiks have often given trouble to the Turkish authorities, whose jurisdiction has till recently been little more than nominal.

Montefiore, the name of an eminent Jewish family which has made a name both in England and abroad. The best known in England of the family is SIR MOSES MONTEFIORE (1784-1885). He was born in Leghorn, where his parents, settled in England, were for the time staying. In 1812 he married Miss Judith Cohen, who was his worthy partner in his many works of benevolence. He set himself vigorously to work to remove the political disabilities which beset Jews in England, and with considerable effect. He himself served as High Sheriff of Kent, and in 1837 was elected Sheriff of London, being knighted in the same year. He received his baronetcy in 1846. He always interested himself on behalf of his nation, and in

Poland, Russia, Roumania, and Damascus he did much to ameliorate their condition. On their behalf he undertook many journeys to the East, the last being in 1874, when he was already greatly advanced in age. In his later years he was a well-known and highly-respected inhabitant of Ramsgate, where he founded the Jewish College, and his 99th birthday was made the occasion of almost universal congratulation.

Montem, the name of a custom which the scholars of Eton College used (until 1847) to hold every third year on Whit Tuesday. They went in procession gaily dressed and with flags and a band, to a mound (*ad montem*) near the Bath road, still called Salt Hill, after the collection of "salt" or money for the captain of the school.

Montenegro (Turkish KARADAGH, native TCHERNAGORA, each name meaning "black mountain") is a principality in the N.W. of Turkey in Europe, having Bosnia and Herzegovina on the N., Bosnia on the E., Albania on the S., the Adriatic Sea and part of Dalmatia on the W. It has an area of 3,486 square miles, and consists of elevated ridges interspersed with peaks varying from five to eight thousand feet high, and presenting an appearance that has been likened to a sea of waves turned into stone. There are fertile plains and valleys, such as Tzernitza and the valleys of Bielopavlich, which are watered by several streams, the chief being the Moratsa, which flows into Lake Scutari. The hills are clothed with valuable forests of oak, beech, ash, holly, sumac, and other trees. There is not much game, but fish abound, especially large trout and carp, which are salted and exported to Vienna. Agriculture and fishing are the chief pursuits, and there are hardly any manufactures beside that of a coarse kind of cloth. Sheep, goats, and pigs are reared, and maize, tobacco, cabbages, cauliflower, potatoes, walnuts, and many kinds of fruit, such as peach, pomegranate, mulberry, olive, almond, apple, are grown. The chief exports are mutton-hams, salt fish, sardines, sumac, cattle, hides, and agricultural and dairy produce. The capital, Cetigne, or Cetinje, is only a large village, and there are two ports, Antivari and Dulcigno. The bulk of the population is a Servian branch of the Slavonic race, of the orthodox faith, and they speak a Slav dialect. They are a tall, robust race, of simple habits, and are accustomed to go about fully armed. There are also about 10,000 Mohammedans in the district added to Montenegro in 1878 by the Treaty of Berlin. The country has a chequered history, and has had a long struggle to maintain its independence, now secured.

Monte Rosa is a peak, or rather a group of peaks, in that part of the Pennine Alps which separates the Swiss canton of Valais from Italy. The Dufourspitze (15,217) is the highest summit, and was first successfully ascended in 1855.

Montespan, FRANÇOISE MARQUISE DE (1641-1707), daughter of the Duke of Montemar, was one of the mistresses of Louis XIV. of France. She married in 1663, and was witty, lively, cultivated,

and beautiful. In 1668 she came to court and soon supplanted Louise de la Vallière, who finally retired in 1674. Her first child by the king was born in 1672, and was committed to the charge of Madame Scarron, afterwards Madame de Maintenon (q.v.). For a long time the marquise had great influence with the king, till at last she was supplanted by Madame de Maintenon. After 1685 she was seldom at court, and finally quitted it in 1691. Like most of the king's mistresses, she took to piety and penitence.

Montesquieu, CHARLES, BARON DE (1689-1755), a French author, was born at the castle of Bréda, near Bordeaux. He was studious in youth, and at the age of twenty had begun to amass materials for his great work, *Esprit des Lois*. Having inherited property from his uncle, he lectured on history at the Academy of Bordeaux, and tried to introduce the study of natural science. In 1721 appeared his *Lettres Persanes*, which gave great offence in some quarters by their original, lively, and at times irreverent, satire. He was admitted to the Academy in 1728, and then he started to travel and study the institutions of Germany, Italy, Hungary, Switzerland, Holland, and England, where he resided two years. In 1734 appeared his *Causes de la Grandeur et de la Décadence des Romains*, and in 1748 his *Esprit des Lois*, which embodied his political studies. He treats of society from the democratic, the despotic, and the monarchical points of view; of the effects of rewards and punishments; of the influence of religion, education, commerce, climate, and physical surroundings. His work has been described as a code of natural law, and himself a legislator for humanity. His *Lettres Familières* appeared in 1767, and his *Œuvres Posthumes* in 1798. There are many editions of his works, one of the best being that published in Paris (7 vols., 1875-79). Montesquieu was of amiable private character, and stories are told of his unostentatious generosity.

Monte Video, a seaport of South America, capital of Uruguay, on the north coast of the La Plata, 130 miles S.E. of Buenos Ayres. It is situated on a moderate elevation at the end of a small peninsula, and is divided into a new and an old part, marks of old ramparts between them still being visible. The streets are regular and well paved, with a good tram-service, and the houses, of one and two storeys, are flat-roofed. Among the chief buildings are the cathedral, town-hall, exchange, and market. The harbour is very shallow, but the bottom is soft, and the vessels—chiefly British—that trade there take little harm by grounding. The principal exports are wool, timber, tallow, jerked-beef, and essence of meat; and the imports woollens, cotton, hardware, and coal. The climate, though damp, is on the whole pleasant and wholesome. The heat in summer is oppressive, and the weather in winter sometimes rough, with keen, piercing air. The soil in the neighbourhood is fertile, and produces many vegetables, and both meat and fish are abundant and cheap.

Montez, LOLA [MARIA DOLORES] (1818-61), was born in Limerick, daughter of an English

officer and a Spanish lady. She went to India, where her father died, and then returned to Europe, and, to escape an uncongenial marriage, she eloped with a Captain James. This marriage ended in a separation, and in 1842 she was again in India. She then went on the stage, and appeared at Her Majesty's theatre, and then made a tour of Europe till, in 1846, she became the favourite of Louis I. of Bavaria. The king made much of her, and her influence was great, but the revolution of 1848 sent her again on her travels. Her next sphere of operations was the United States, where she was married three times. Then after a tour in Australia she began lecturing in New York. The last years of her life were spent in penitence, and she died at Long Island.

Montezuma, Emperor of Mexico in the 16th century at the time of the Spanish conquest. In 1519 he was cowed by an old prophecy, and received Cortes (q.v.) after the conquest of the Tlascalans as a divine being, but when he found the Spaniards to be but mortal, he plotted, and Cortes seized him, made him acknowledge the king of Spain, and kept him in chains, forcing him to witness the torture of his subjects and friends. On the occasion of a rising, Montezuma in royal robes was brought forward to try to pacify the people, and was struck by a stone thrown by one of his indignant subjects. From the effects of this wound, or from a broken heart, he died in 1520. His children were converted, and one of them became the founder of a family of Spanish nobility, the last representative of which died at New Orleans in 1836.

Montferrat, once a duchy of Italy between Genoa, Piedmont, and Milan, lying in two detached portions between the Maritime Alps and the Po, and containing 1,000 square miles. Its capital was Casale. A Marquis of Montferrat existed in 980, and in 1536 Charles V. granted the territory to the Duke of Mantua. It was made a duchy by Maximilian in 1574. In 1631 part was ceded to Savoy, and the rest was annexed by the Emperor Joseph in 1708.

Montfort, SIMON DE (c. 1200–65), was the son of the Simon who harried the Albigenes. He was born in France, but came early to England, where, through his grandmother, he had a claim to the earldom of Leicester. He did not obtain the earldom till it was granted him by Henry III. in 1231. In 1238 he married the king's sister, the Countess of Pembroke, and was soon after made seneschal of Gascony. His harsh rule drove the people into revolt, and he was recalled, and had a violent scene with the king. A reconciliation followed, and De Montfort was employed on military and diplomatic service. He joined the discontented barons, and took part, in 1258, in the Mad Parliament, which resulted in the Provisions of Oxford. For some years he presided over the twenty-four barons, who managed the affairs of the kingdom. After the battle of Lewes, in 1264, De Montfort, possibly in consequence of dissensions among the barons, took the step which has identified his name with the history of Parliament—namely, the

summoning of the Commons to send members to join in the deliberations. Like many other great measures, this was entered upon in probable unconsciousness of its important bearing upon the future, regard being had only to its immediate advantages. The Parliament met in 1265, and in this same year De Montfort was slain at the battle of Evesham. He was long regarded as a saint by the people.

Montgomery, JAMES (1771–1854), poet, was born in Ayrshire, where his father was a Moravian minister, and was educated at a Moravian school near Leeds. In 1792 he took work with a bookseller at Sheffield who owned and edited the *Sheffield Register*. Fear of the libel laws caused the editor to abscond, and Montgomery took on the editing of the paper, which now appeared as the *Sheffield Iris*. In the conduct of this paper he incurred two terms of imprisonment, which resulted in the appearance of *Prison Amusements* (1797). In 1806 he published *Wanderer in Switzerland*, followed in 1809 by the *West Indies*, a poem on the slave-trade, in 1813 the *World before the Flood*, in 1819 *Greenland*, a missionary poem, and in 1827 *Pelican Island*. Among these volumes were scattered many smaller pieces. He retired from the *Iris* in 1825.

Montgomery, ROBERT (1807–55), poet, was born at Bath, and when quite young published a weekly periodical called *The Inspector*. In 1827 he published a satire, *The Age Reviewed*, in 1828 an epic, *The Omnipresence of the Deity*, which was severely criticised by Macaulay in the *Edinburgh Review*, and shortly afterwards *Satan*, from which he gained the nickname Satan Montgomery. He then went to Oxford, and took orders. *The Messiah*, *Luther*, and *The Sanctuary* are later poems of his, and several of his hymns have been very generally adopted for congregational use.

Montgomeryshire, an inland county of North Wales, 40 miles long by 33 miles broad, and containing 773 square miles, one-third of which is pasture. It has Denbigh on the N.E., Merioneth N.W., Salop E., Radnor S., and Cardigan S.W. The surface is broken and undulating, and in parts mountainous, especially where it rises towards Plinlimmon on the borders of Cardigan. In the N.E. are the Berwyn Mountains, and towards the English border are the Breidden Hills, near Shrewsbury. Much of the land is barren, but there are fertile, well-wooded valleys, and oats and fruit are grown, while large flocks are fed upon the uplands. The rivers are the Severn, with its tributaries the Vyrnwy (the valley of which has been turned into a reservoir for the Liverpool water-supply) and the Dovey or Dyfi (noted for its fish), and the Wye which flows into Radnor. In the wide river valleys much oak and other timber is found. A canal, 27 miles long, connects with the Ellesmere Canal, and gives communication with Chester and Shrewsbury. The mineral products are lead, zinc, slate, and limestone, the first being the most important. Welsh flannel is manufactured at Newtown, and woollen cloth in most of the towns. Llanidloes and Welshpool are municipal boroughs.

The county town, Montgomery (seven miles S. of Welshpool and 53 miles N.W. of Birmingham), is on the Severn. It has a fine Early English cruciform church, and on a hill above are the ruins of a castle held by Roger de Montgomery, from whom the town takes its name. The county returns one member to Parliament, and the boroughs return one.

Month, originally (and when described as lunar) the interval between one new moon and the next, containing 29·530589 days. A solar month is the twelfth part of the solar year, containing 30·43685 days. A calendar month is one of the twelve divisions of the civil or calendar year, of which April, June, September, and November contain 30 days, February 28 (in leap year 29) days, the rest 31 days. Astronomers also use the terms anomalistic month, dracontic or nodical month, sidereal month, and tropical month, all with respect to revolution of the moon about the earth.

Montholon, CHARLES TRISTAN DE, COMTE (1782-1853), the companion and historian of Napoleon's captivity at St. Helena, began his career in the French navy. He afterwards entered the army, and was wounded at Wagram. He was made Imperial Chamberlain in 1809, and was Adjutant-General during the Hundred Days. Having been named chief of the staff by Louis Napoleon in 1840, he was condemned to twenty years' imprisonment, but was released in 1848. He published *Mémoires pour servir à l'Histoire de France sous Napoléon, écrits à Ste.-Hélène sous sa dictée* (1822-25), and *Récits de la Captivité de Napoléon à Ste.-Hélène* (1846).

Monthyon Prizes, prizes awarded annually in Paris under the will of a French lawyer, Baron de Monthyon, who died in 1820. He bequeathed 10,000 francs for an annual prize for the discoverer of any mode of diminishing the unhealthiness of a mechanical art, and 10,000 francs for an annual prize for the inventor of any means of perfecting medical science or surgery, to be awarded by the Academy of Sciences; also 10,000 francs for the French person who shall have performed the most virtuous action during the year; and 10,000 francs to the French person who shall have published in France the book most beneficial to morals, to be awarded by the French Academy.

Montmorency, MATTHIEU DE, was Constable of France and regent during the absence on crusade of Louis VII., whose mother was his second wife. He died in 1160. His son, MATTHIEU, Grand Constable of France, distinguished himself at the battle of Bouvines, and was a leading personage during the reign of Louis VIII. and the early years of Louis IX. He died in 1230. ANNE (1493-1567), first duke and Constable of France, was the best general of Francis I. in his wars with Charles V. He was taken prisoner at Pavia, but after his liberation successfully defended Marseilles against the Emperor (1536). Under Henri II., besides other services, he captured Metz, Toul, and Verdun, but was made prisoner at the battle of St. Quentin (1557). In 1562, at the battle of Dreux, he was again made prisoner, and in 1567 was mortally

wounded at the battle of St. Denis. His grandson, HENRI (1595-1632), Constable and marshal, after a distinguished military career in the Huguenot wars, took part in the conspiracy of Gaston of Orleans, and, being defeated and captured at Castelnaudary, was executed.

Montpellier, a city of southern France, capital of Hérault, stands on a slope about six miles from the sea, 75 miles N.W. of Marseilles. The town was granted by Louis IX. the privilege of free trade with the rest of France, and from this time its prosperity grew more rapidly. In 1350 it passed from the house of Aragon to that of Valois. In 1536 it became an episcopal see, but in the next century was one of the strongholds of the Huguenots. It was captured by Louis XIII., and some years later suffered under a terrible plague. The cathedral, which was restored in the early part of the 17th century, is one of the largest churches in the south of France. Montpellier also has a university (founded in 1292 by Pope Nicholas IV.), a famous medical school, dating from a still earlier period, and the oldest botanical garden in France. There are also some fine scientific collections and a splendid museum. The Place du Peyron, a magnificent square, with a terrace looking on the Mediterranean, is celebrated for its gateway (a triumphal Doric arch), and for two promenades leading to the boulevards. Montpellier has large manufactories of wax-tapers, candles, and soap, and does a large trade in wine and brandy.

Montpensier, LOUISE D'ORLÉANS, DUCHESSE DE (1657-93), was daughter of Gaston, Duc d'Orléans and niece of Louis XIII. Disappointed in her wish to marry Louis XIV., "Mademoiselle" revenged herself on Mazarin by her warlike exploits. In the second Fronde she herself commanded an army, captured Orleans, and afterwards took possession of the Bastille. After the battle of the Faubourg St.-Antoine (1652) she lived in the Luxembourg and mediated between the Royalists and the Frondeurs. She married the Duc de Lauzun; but his cruelty caused a separation, and she became *dévot*e. She left *Mémoires* which are of great historical interest. [ORLEANS.]

Montreal, the largest city in Canada, stands on an island at the junction of the St. Lawrence with the Ottawa river. It derives its name from Mount Royal, a mass of rock 700 feet high, which rises behind the city. It was first visited by Jacques Cartier in 1535. Later on in the century De Champlain arrived; and in 1665 it was first garrisoned with the French troops, fortified, and made a centre of the fur trade. It remained in the possession of France till 1759. In 1776-77 it was for a few months occupied by the Americans. The city is partly Catholic and French, partly Protestant and English. The Romanists have a fine cathedral and a Jesuits' church. Christ church is a Protestant building in the Decorated Gothic style. The city-hall is in the modern French style. The Hôtel Dieu Hospital will hold 3,000 patients, and is served by nuns. The Bonsecours market, surmounted by a dome, is also a striking feature of the city. Among educational institutions are the

McGill College, founded in 1813; the Catholic seminary of St. Sulpice; and the McGill and Jacques Cartier normal schools. The harbour of Montreal is a fine one; its quays and wharves extend for more than a mile along the river. Numerous engine-works, saw-mills, tool-factories, etc., are worked by the water-power derived from the falls above the town. There are also many woollen- and cotton-mills, boot and shoe and tobacco factories; and sugar-refining is an important industry. The Victoria Railway Tubular Bridge, more than 9,000 feet long, connects the city of Montreal with St. Helen's and Nun's islands. The water supply of the city is obtained from a reservoir excavated out of the rock on Mount Royal. Most of the buildings are made of grey limestone. Montreal is represented in the Dominion House of Commons by three members, and in the Quebec legislature by the same number.

Montrose, JAMES GRAHAM, 5TH EARL AND 1ST MARQUIS OF (1612-50), came of an ancient family from Montrose, in Forfarshire. He first became an important figure in Scotland when, in 1637, he took part in the drawing up of the Covenant. For the Presbyterians he won the victories of Stonehaven and the Bridge of the Dee, and in 1640 was with the Scottish army which invaded England; but about this time he was gained over by Charles I. By the influence of Hamilton and other enemies he was imprisoned in Edinburgh Castle by order of the Scots Parliament. After his liberation he appeared openly on the Royalist side, and in the brilliant campaign of 1644-45 won six victories, and advanced towards the Border to help Charles I. in England. His Highland forces, however, deserted him in order to secure their booty, and the remnant of his army was surprised and defeated by David Lesley at Philiphaugh (September, 1645). Montrose now passed three years on the Continent, but on the news of the execution of the king again landed in Scotland and tried to raise the Highlands. He was, however, routed at Inverearrion, in Ross-shire, and having been captured soon after, was hanged at Edinburgh, where a monument was raised to him in St. Giles's in 1888.

Montserrat. 1. A mountain in Spain, 4,057 feet high, is 30 miles N.W. of Barcelona. Half-way up the slope is a Benedictine abbey with a celebrated miracle-working image of the Virgin. In 1811 the abbey was plundered by the French troops, who also put to death the hermits and monks who had received French *émigrés*. In 1827 Montserrat was a Carlist stronghold.

2. One of the British West India islands, belonging to the group of the Lesser Antilles, has an area

of 32 square miles. Discovered by Columbus in 1493, it was colonised by Great Britain in 1632, and has been in her possession ever since, except for short intervals in time of war. Lime-juice and sugar are the chief products of the island, which is considered the healthiest in the West Indies.

Moody, DWIGHT LYMAN, was born in 1837 at Northfield, Massachusetts. In 1856 he began his missionary work while in business at Chicago. In 1873 he came to England, accompanied by a singer named Ira David Sankey, whom he had met three years before, and attracted large crowds to his services. In 1883 they again came to England.



PHOTOGRAPH OF THE MOON.

Moody has published several popular devotional works.

Moon, THE, the satellite of the earth, is the nearest to us of all the heavenly bodies, being at a mean distance of 240,000 miles. Its diameter is 2,153 miles and, its density being little more than half that of the earth, the force of gravity at its surface is very much less than that at the surface of the earth. A body which weighs a pound here would only weigh about $2\frac{1}{2}$ ounces if taken to the moon. Her path is approximately an ellipse with the earth in one focus. [For the causes affecting its motion see LUNAR THEORY.] Its apparent motion in the sky is from west to east, but she moves much faster than the sun, taking about 27 days 8 hours to travel all round the earth. The time between two successive new moons (synodic period or lunation) is $29\frac{1}{2}$ days. The reason of the difference is that the sun

slowly moves in his annual course through the stars in the same direction as the moon, which therefore in its revolution round the earth has to overtake him when it returns. The moon rotates on its axis in the same time as it performs a revolution in its orbit; hence the same half is always turned towards us. [LIBRATION.] Except at opposition—*i.e.* when the earth is between the moon and sun—the whole of the moon's disc does not appear bright to us, and the amount of the bright surface seen by us is found to depend on the relative positions of moon and sun. Half of the moon is always illuminated by the sun; but when it is in conjunction between the earth and sun the whole of the bright surface is on the side away from us; so that the moon is invisible. As it moves farther from the line joining earth and sun, a small portion of the bright side comes into view as a narrow crescent. This increases till half the disc is illuminated, when the lines joining earth and moon and earth and sun are at right angles. From this time the moon loses its crescent shape and becomes convex on both sides, or gibbous—the maximum brightness, or full moon, occurring when sun and moon are on opposite sides of the earth. After this the moon becomes gibbous, then crescent, and vanishes before the time of new moon. These are known as the *phases* of the moon. If the moon's orbit coincided with the ecliptic there would be a solar eclipse at every new moon and a lunar eclipse at every full moon; but the inclination of the lunar orbit allows the moon to be sometimes as far as 5° on either side of the sun. It is only when the moon is near one of its nodes (*q.v.*), at conjunction or opposition, that an eclipse can occur. Every year there must be two solar eclipses, and may be five, while there may be three lunar eclipses or none. From the fact that when a star passes behind the moon the rays from the star are not refracted at the moon's edge, it has been deduced that no atmosphere surrounds the moon. Its surface is seen to be very irregular, and the dark and light parts were thought in earlier times to be seas and continents; but there is now evidence which renders the absence of water certain. Mountains there are, as is proved by the shadows of them cast by the sun, and measurements of these shadows have shown that some of the mountains exceed an altitude of two miles. Many of them appear to have huge craters, often ten miles across, and others form circular rings round low-lying plains. The moon has long been known to have an effect upon the tides, and may perhaps influence the winds. It is of enormous importance to navigators for the determination of longitude, and hence its movements have been investigated with the greatest care and precision.

Moonwort (*Botrychium Lunaria*), a somewhat uncommon British plant, forming with the adder's-tongue (*Ophioglossum vulgatum*) our only representatives of the Ophioglossaceæ, a group closely related to the ferns. The prothallus is subterranean, colourless, and monœcious, as in club-mosses; the stem short, erect, and unbranched, and there is generally only one leaf. This takes five years to

develop, has a long stalk, is leathery and smooth, and divides at an early period into two branches. One of these is green and barren, and gives its name to the plant by dividing pinnately into half-moon-shaped segments; the other is also pinnate, but has no green cellular tissue, consisting entirely of globular sporanges, each formed from a group of cells (*cusporangiate*) taking a year to develop and bursting in two halves.

Moor, one of the most confusing terms in ethnology. *Mauharta* (whence the Greek and Latin *Mauri*, *Mauritania*) was a Phœnician word meaning "Westerns," originally applied by the Carthaginians to the Hamitic (Berber) aborigines of the Atlas region, stretching west of Carthage. Later it was transferred in its modern forms (*Maures*, *Mori*, *Moors*) to the Arabs and Berbers of the same region indifferently, and then in a vague way to all Africans, and especially to Mohammedan Africans—the mediæval Arabs and Berbers being all Mohammedans. Then all Africans being popularly "Negroes," a Moor became a Negro, or at least a person of black colour (as in "Blackamoor"), and "the Moor of Venice," supposed to be a black (though in the original merely a swarthy Arab or Berber of the Barbary States), one of those Mohammedan "renegades" often employed in the service of the Christian Powers. The colour idea became fixed, and in the popular fancy a Moor is still a Negro; but locally the word has partly recovered its original meaning, and in the Atlas regions it is now commonly applied to the "civilised" Arabo-Berber urban populations in contradistinction to the wild hillmen and the nomads of the desert. In this more correct sense it travelled round the Continent with the Portuguese, for whom the civilised Mohammedan peoples of the east coast were all "Mauros"; and at present the half-caste Moslem Arab communities of Malabar, Ceylon, and Malaysia are similarly called Moors or Moormen by the Dutch and English. In Ceylon especially they are numerous, settled chiefly on the northern coastlands, where they have a monopoly of the local retail trade. Other applications of the word—as by the French to some of the Senegal peoples, generally find their explanation in the fact that those thus designated present social and religious features analogous to those of the present Mauritanian populations.

Moore, SIR GRAHAM, British admiral, was born about the year 1765, and, having entered the royal navy, became a post-captain in 1794. He was senior officer of a squadron which in 1804 captured three Spanish treasure-ships and sank a fourth. In 1812 he attained flag rank, and assumed chief command in the Baltic. He was afterwards for four years a Lord of the Admiralty, from 1820 to 1823 commander-in-chief of the Mediterranean, and from 1839 to 1842 port admiral at Plymouth. He died an admiral, a G.C.B., and a G.C.M.G., in 1843.

Moore, SIR JOHN, BART., British admiral, was born in 1718. At ten years of age he was sent to sea, and, having plenty of family influence, was made a captain at the age of twenty-five. In

1747, with Rear-Admiral Hawke, he participated in the highly successful action with a French squadron off La Rochelle. In 1756 he was a member of the court-martial that tried Admiral Byng. In 1757 he hoisted a broad pennant, and took command of the Leeward Islands station, but his main service to his country was his capture of Guadaloupe on May Day, 1759. Captain Moore, who soon afterwards returned to England, became a rear-admiral in 1762. In 1766 he was created a baronet, and later in the same year was appointed port admiral at Portsmouth. He died in 1778.

Moore, SIR JOHN (1761–1809), the well-known general, was the eldest son of DR. JOHN MOORE (1730–1802), the author of *Zeluco*. Entering the army in 1777, he served in the American War and in Corsica, and in 1796 captured St. Lucia, of which island he became governor. In 1797–98 he was employed in Ireland; was wounded in the expedition to Holland in the following year; and in 1800 commanded the reserve in Egypt under Sir Ralph Abercromby. He afterwards served in Sicily and Sweden, and in August, 1808, went to the Peninsula. In October he was given the command of an army destined to co-operate with the Spanish forces. Having advanced as far as Salamanca, he was obliged to retreat towards the coast, whither the French followed him. When on January 13, 1809, the British reached Corunna, their transports had not arrived; and three days later they were brought to bay by the French. The latter were defeated, and the British troops were able to effect their embarkation, but without their leader, who was mortally wounded. Sir John Moore was buried on the field of battle; but monuments were raised to him in St. Paul's and (by the French marshal Soult) at Corunna.

Moore, THOMAS (1779–1852), was the son of a Dublin grocer. In 1794 he entered at Trinity College, where he associated with Robert Emmet, and displeased the authorities by his revolutionary proceedings. After taking his degree he, in 1799, came to London, and entered at the Middle Temple. In the following year he issued his translation of Anacreon, and in 1801 published a volume of poems under the pseudonym "Thomas Little." In 1803 he obtained through Lord Moira the post of registrar of the Admiralty Court of Bermuda, but immediately appointed a deputy, and, after a tour in Canada and the United States, returned to Europe in 1806. Jeffrey's criticism of Moore's *Odes and Epistles* led to a bloodless duel and a fast friendship, and an intimacy with Byron followed a few years later. His *National Airs* appeared in 1815, and in 1817 *Lalla Rookh* was published. In 1819, in order to avoid the arrest with which the defalcation of his Bermudan deputy threatened him, he went on a Continental tour in company with Lord John Russell, the future editor of his *Memoirs and Correspondence*. Whilst on a visit to Byron at Venice he received from the poet the MS. of his autobiography, which Murray purchased, but afterwards decided to destroy. Moore now lived for a few years at Paris, where his *Loves of the Angels* and *Epicurean* were written. He returned to his

house at Sloperton in 1822, and here composed his lives of Sheridan, Lord E. Fitzgerald, and Lord Byron. In 1835 he received a pension from Lord Melbourne. In his last years his faculties decayed.

Moorhen, or WATER-HEN (*Gallinula chloropus*), a common British Rail, with a wide range in Europe, Africa, and Asia, having close allies in America and Australia. The total length is about a foot; the general plumage is olive-brown and purplish-grey, with some small patches of white. These birds frequent ponds and streams, generally nesting in the flags and reeds on the banks. They swim and dive well and feed on aquatic vegetation, worms, molluscs, and small fish.

Mooring. To moor is to confine or secure a ship, otherwise than by a single anchor, in a particular situation. Mooring may be effected either by letting go two anchors in such a manner that the strain on the two is equally divided, or by shackling one or more of the ship's cables to a buoy, or to anchors that have been previously placed in position, or to "chain mooring." These are an assemblage of anchors, chains, and bridles laid athwart the bottom of a river or harbour for the purpose. When two anchors are dropped by a ship, the cables of both are, as a rule, afterwards shackled together, and from the point of union a single cable is led in through one hawshole.

Moose. [ELK.]

Moplah (MAPILLAH), low-caste communities, at Calicut and other districts, especially on the Malabar Coast, India, are generally of a ruddy black colour, with black, wavy hair and of Malayalim (Dravidian) speech; they appear to be half-breeds sprung from Arab immigrants, who intermarried with the Tiyars. The same term (*Moplay*) is applied to the natives of the Laccadive Islands, apparently of mixed Nair and Arab descent—Nairs by tradition, Mohammedans by religion, and of Malayalim speech.

Moqui (MOKI, TUSAYAN), one of the chief branches of the Pueblo Indians [PUEBLO], who founded six *pueblos* (village settlements) east of the Colorado Chiquito, in East Arizona and New Mexico. With this group is connected a seventh *pueblo* inhabited by people of Tañonan stock; but the Moqui themselves are members of the great Shoshonean (Snake) family. In 1890 they numbered collectively 1,996, all still occupying their original *pueblos*.

Morabits, or ALMORAVIDES, a dynasty of Moors who flourished in the eleventh century, and who were overthrown by the Almshades.

Moraines are masses of *débris* found on glaciers. Stones and rocks are constantly falling from the sides of the mountains on to the glacier, and form a fringe of rubbish all along the edge of the ice. These fringes are the *lateral moraines*. When two glaciers meet, the adjoining lateral moraines of each unite to form one; and, as the double glacier moves slowly on its downward path, the mass of *débris* is carried with it, so that a central line of stones, etc., or a *medial moraine*

extends to the end of this ice river. As the stones come to the glacier's mouth, the ice melts from under them, and they are left to form constantly-increasing heaps and ridges, known as *terminal moraines*.

Moravia (MÄHREN), a province of Austria-Hungary, is situated between Bohemia and Hungary, having Silesia on the N. and Lower Austria on the S. It has an area of 8,579 square miles. The Slavonian inhabitants were subjected by Charlemagne, and Christianity was introduced in the 9th century. In the 11th century Moravia formed one territory with Bohemia, which its duke had conquered. After the battle of Mohacz (1526) it came into the possession of the house of Austria; but it was not until 1849 that it became a separate province. Moravia is surrounded by mountains, and is well watered by numerous streams. From its fertile soil good crops of rye and oats, wheat and barley, and several fruits are produced; and there is also some excellent pasture, on which good breeds of cattle are reared. Coal and iron are found, and several manufactures flourish. Slavs form the bulk of the population, and the immense majority of the people are Roman Catholics. Brünn and Olmütz are the chief towns.

Moravians, the United Brethren or *Unitas Fratrum*, said to have been founded by John Huss. They were expelled from Moravia and Bohemia in 1627, and in 1722 a few members settled at Herrnhut, in Saxony, whence the sect spread over Germany, Britain, and America. They accept the Bible as their only authority, and hold that human nature is thoroughly depraved. They are episcopalian, and use a liturgy. They are most noted for their missionary work and for their influence upon Methodism.

Moray, JAMES STEWART, EARL OF, generally known as the REGENT MURRAY, was a natural son of James V. On the return of his half-sister, Mary, from France, he did his best to advise her, but, being a Protestant, strongly opposed the Darnley marriage. After the murder of the king-consort, at which he is said to have "looked through his fingers," he went to France, but on the abdication of Mary was appointed Regent of Scotland. He brought to trial the murderers of Darnley, but headed the army which defeated Mary at Langside after her escape in 1568. On his return to Scotland after the conferences at York and Hampton Court [MARY STEWART], he had to put down a conspiracy of the Hamiltons, who had supported Mary from selfish motives, and to repress the lawlessness of the border. While engaged in his preparations he was assassinated at Linlithgow in 1570.

Morbihan, a French department, formerly part of the province of Brittany, has Finisterre and Côtes du Nord on the N. and W., Ille-et-Vilaine on the E., and Loire-Inférieure on the S.E. It has an area of 2,624 square miles, including the island of Belle Isle. There are several smaller islands. A large part is covered by heath and marsh. The chief towns are Vannes and L'Orient. The name (Breton for *little sea*) is properly that of the inland

archipelago on the W., remarkable alike for the number of its islands and the force of its tides.

Mordants. [DYEING.]

Mordvinians, a branch of the Volga Finns, chiefly west of the Volga between Nijni-Novgorod and the Don Cossack territory; two sections, *Ersia* and *Moksha* (a third, *Karatai*, are dispersed). They were formerly far more numerous and widespread, and in the 10th century Constantine Porphyrogenetus speaks of them as a very powerful nation inhabiting the land of *Mordia* in central Russia; but they were reduced by Ivan the Terrible in the 16th century, and since then many have become Russified. Most of them were pagans till the 18th century, when nearly all became at least nominal Christians ("Orthodox Greeks"), though still practising many heathen rites. Formerly nomads, they are now settled agriculturists, but still speak a Finnish dialect, closely related to the Cheremissian.

More, HANNAH (1745-1833), was born near Bristol, where she taught for sometime in a boarding-school kept by her elder sisters. An annuity bestowed upon her by an admirer of her early works enabled her to give herself up to writing. In 1776 she became a friend of Garrick, who in the next year brought out her tragedy *Percy* at Covent Garden. In 1782 she published *Sacred Dramas*, and then retired to a cottage near Bristol, where she continued to write, but also did much good among the people of the neighbourhood. Her most popular works were *Cælebs in Search of a Wife* (1809), *Practical Piety* (1811), and *The Shepherd of Salisbury Plain*, a tract. She died at Clifton.

More, HENRY (1614-87), the Cambridge Platonist, a native of Grantham, was educated at Eton and Cambridge, where he became fellow of Christ's College. His best work is *Divine Dialogues* (1668). In his later years he became tinged with mysticism. Collections of his theological and philosophical works appeared respectively in 1675 and 1678.

More, SIR THOMAS (1478(?) - 1535), was brought up in the house of Archbishop Morton (q.v.), who sent him to Oxford. In 1501 he entered Parliament, and soon became prominent for his opposition to the exactions of Henry VII. In 1508 he was made a judge in the sheriff's court and two years later under-sheriff of London. He was introduced to the notice of Henry VIII. by Wolsey, and became very intimate with the king. He was employed in important diplomatic missions in 1514 and 1527, and created a knight and Privy Councillor. As Speaker of the House of Commons he opposed Wolsey's attempts at arbitrary taxation, but nevertheless was appointed to the offices of Master of Requests and Chancellor of the Duchy of Lancaster. In 1529 he became Lord Chancellor, and took an active part in promoting reforms in the Church. Being opposed to a breach with Rome, he was, however, deprived of the seals in 1532, and two years later was sent to the Tower. All devices were tried in vain to make him take the oath acknowledging the king's headship of the Church, and he was executed in 1535 on a charge of

misprision of treason. His *Utopia*, in which many social changes were anticipated, was translated from the Latin in 1556. He wrote in English a *History of Richard III.*

Morea, the modern name of the southern half of Greece, anciently called the PELOPONNESOS. Its name is derived by some from the Latin word for mulberry (*morus*), the leaf of which it somewhat resembles in shape; but some modern scholars trace its origin to the Slavonic *more* ("the sea"). The Slav immigrants were subdued by the Eastern Emperors, one of whom, Michael Palæologus VIII., partially recovered it from the Normans, who had held it since 1205. During the Middle Ages the peninsula was the scene of endless strife. Towards the end of the 15th century the Turks acquired the larger portion of it. Venice reconquered it in 1684, but lost it again in 1714; and it remained Turkish till the Greek War of Independence.

Moreau, JEAN VICTOR (1763-1813), was born at Morlaix, Brittany. On the outbreak of the Revolutionary wars he abandoned a legal for a military career, and in 1794 was named general of division. As such he distinguished himself with Piehgru in the conquest of Belgium and Holland, and in 1796 was appointed to succeed to his command on the Moselle and Rhine, when he distinguished himself by his victories over the Austrians, and still more by a masterly retreat across the Rhine. After 18 Fructidor he was deprived of his command; but in 1798, while serving with Schérer in Italy, saved the French from destruction by Suvarof by another masterly retreat. After the death of Joubert at Novi he assumed the chief command; and, on his return to France, was offered by Siéyès the generalship of the insurgent directors. He preferred, however, to assist Bonaparte, who, however (18 Brumaire), gave him the command on the Rhine. By the conduct of the campaign of 1800, when he won the battle of Hohenlinden, he showed himself one of the greatest generals in Europe, but at the same time incurred the jealousy of Bonaparte. The latter obtained his condemnation and banishment (1804). Moreau remained in the United States till 1813, when he joined the enemies of Napoleon, and was mortally wounded by a cannon-ball at Dresden.

Morecambe Bay, on the coast of Lancashire, separates Furness from the main part of the county. It is 18 miles long and about 10 broad. Into it flow the Lune, the Leven, and some smaller streams.

Morelia, a Mexican city, capital of the state of Michoacan, stands more than 6,000 feet above the level of the sea. Its former name was Valladolid. It has a cathedral and fairly flourishing manufactures. Here were born Morelos and Iturbide.

Morgan, SIR HENRY, a noted buccaneer and adventurer, who was born in Wales in 1632. Having obtained great influence over the pirates in the West Indies, he became their chief, took and plundered the town of Puerto del Principe, forced the entrance to Lake Maracaibo, sacked both Maracaibo and Gibraltar, another town on the lake, and committed unheard-of atrocities. In the meantime a Spanish squadron blocked up the mouth of the lake, but Morgan cleared the channel by means of a fireship, and made his escape. This was in 1669. In 1670-71 he captured Santa Catalina and San Lorenzo, and sacked the rich city of Panama, which he then burnt. In the course of his piratical career he was at least once imprisoned, but he was secretly favoured by Charles II., and was in time knighted and made successively Commissioner of the Admiralty Court and Lieutenant-Governor of Jamaica. He died in 1690.

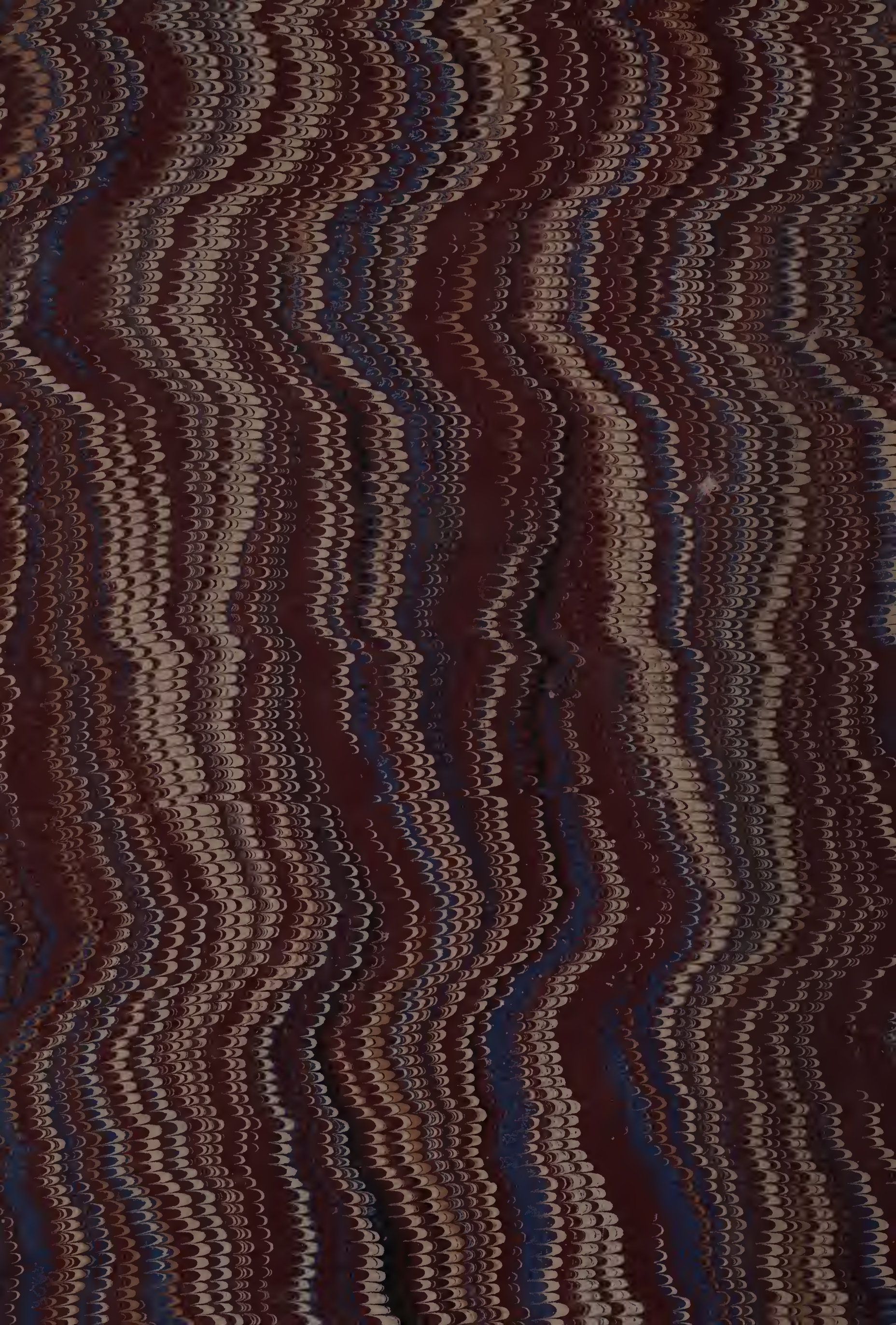
Morgan (SYDNEY OWENSON), LADY, novelist and memoir-writer, was born, the daughter of an Irish actor, between 1775 and 1780. She came to London to retrieve the family fortunes, and in 1806 made a name by the publication of *The Wild Irish Girl*. Besides several other novels she wrote interesting works on France and Italy and left some lively *Memoirs*, which were edited in 1862 by Hepworth Dixon. In 1812 she married a physician named Morgan, and in 1837 received a Civil List pension of £300. She died in 1859.

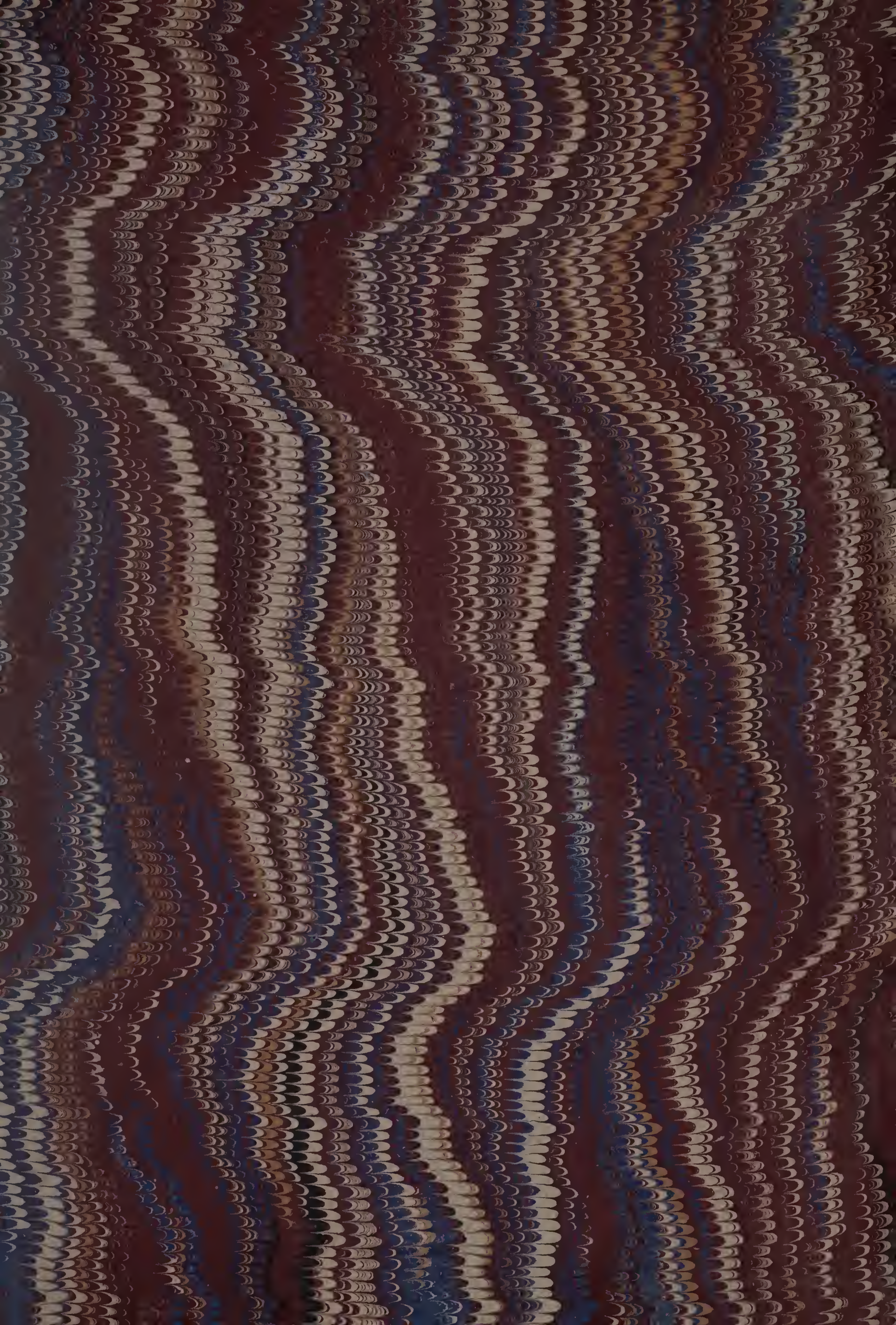
Morghen, RAFFAELLE SANZIO (1758-1833), the great engraver, was born at Naples. In 1781 he engraved Raffaele's *Poetry* and *Theology*, and afterwards *The Transfiguration* of the same master, and Leonardo's *Last Supper*, Andrea del Sarto's *Madonna del Sacro*, and other famous pictures. He died at Florence, where he had established a school of engraving and had been provided with a pension and free quarters from the Grand Duke. He married a daughter of Volpato, his master at Rome. Morghen's *Life* was written by his pupil, Palmarino; in the book is a catalogue of his works.

Morgue, a dead-house in which bodies of persons found dead are exposed for identification. The best known is that in Paris.

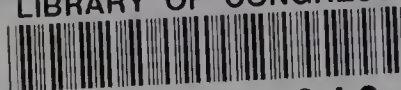
Moriscos, Moors who remained in Spain after their conquest by the Spaniards. The Moriscos were expelled from Spain in 1609.

Morison, JAMES COTTER (1831-88), one of the English Positivists, was educated at Highgate and Oxford. His chief works were *The Life and Times of Saint Bernard* and *The Service of Man*. He also collected materials for a history of the French Revolution, but was prevented by ill-health from undertaking it: and he took a leading part in the foundation of the *Fortnightly Review*.





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